NGOs and Participatory Conservation in Developing Countries: Why Are There Inefficiencies?

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Abstract

Participatory conservation projects run by NGOs in developing countries imply involvement of communities in conservation efforts, to combine economic development with environmental preservation. We build an economic model explaining the emergence of participatory conservation and its contradictions linked to the conflicting incentives of local farmers, NGOs, and donors. The tragedy of the commons in a natural area justifies an NGO intervention. Contractual incompleteness calls for participatory conservation. However, if the revenue from the conservation project is uncertain, the community abstains from conservation unless the NGO allocates resources to agriculture. The NGO must deviate from its narrow mission to reach its broad mission. If the NGO is funded by conservation-oriented donors, it struggles to justify diverting resources to agriculture. Thus, the NGO faces a "size versus efficiency" dilemma: poorly conserving a larger area (non-cooperating local community, satisfied donors) or conserving well a smaller area (local community cooperation, unsatisfied donors).

1. Introduction

In the past several decades two major arguments emerged in the development narrative. The first is that participation of target beneficiaries in project design and implementation is necessary for project success (Mansuri and Rao 2004). The second is that the objective of environmental sustainability and conservation can, and should, be coupled with economic development (Garnett et al. 2007). As a consequence, we observe a massive spread of the so-called "participatory conservation" projects in developing countries, implemented by various development cooperation actors.

Participatory conservation is a major current practice in settings where a developing-country community lives in an area with a natural resource that needs to be protected. Participatory conservation directly involves the community in conservation activities, granting them with certain rights and imposing certain responsibilities linked to these activities. Such practice is also called "integrated conservation and development projects" (ICDPs) and "community-based natural resource management" (CBNRM) (Hughes and Flintan 2001, Twyman 2017), and has been extensively studied by scholars in several disciplines (see Gasteyer et al. 2016, Reid et al. 2016, for reviews).

Although the large increase in the number of these projects is rather recent, such projects have a longer history in development cooperation. An early project was the Luangwa Valley Project co-funded by the Food and Agriculture Organization and the Government of Zambia in the 1960s (Child and Dalal-Clayton 2004). The aim of the project was to secure benefits from wildlife management for the local communities. By the 1990s, the concept of participatory conservation entered the initiatives of most major international organizations (Wells et al. 2004). As noted by Garnett et al. (2007), "Organizations whose primary mission is conservation and those whose mission is development have both adopted the ICDP approach in some form". Consequently, the definition of participatory conservation has expanded, so that such projects are now described as "(...) approaches to the management and conservation of natural resources in areas of significant biodiversity value that aim to reconcile the biodiversity conservation and socioeconomic development interests of multiple stakeholders at local, regional, national and international levels" (Franks and Blomley 2004, cited in Garnett et al. 2007: 2).

Usually participatory conservation implies creating a protected area, with the local community becoming its stakeholder, i.e. the community becomes directly involved in the decision-making process and takes over various responsibilities concerning the management of the conservation area and receiving the income generated from the conservation efforts, mainly through tourism. This requires, however, that the community commits to exploiting only a limited quantity of the resources of the conserved area and to pursuing the agricultural, grazing, or hunting activities strictly outside the protected area (Hughes & Flintan 2001, Blaikie 2006, Garnett et al. 2007, Galvin & Haller 2008, Murphree 2002).

The proponents of participatory conservation put forward three main arguments in favor of these projects. The first is the frequent failure of top-down approaches in conservation. Second is the recognition that the cooperation of local population is key for effective conservation (Edmonds 2002). Finally, these projects guarantee access rights to natural resources for local communities whose livelihood depends on those resources (Ostrom 1990, Baland and Platteau 1996, Agrawal 2007, Campbell and Vainio-Mattila 2003).

However, the success of participatory conservation in meeting either conservation or development objectives in practice has been, at best, mixed. These two large objectives are rarely integrated, as synergies do not emerge spontaneously. There are numerous cases of failure to reach the conservation objective, and the loss of biodiversity is common. The successes in the environmental dimension are rarely linked to substantial permanent improvements in the wealth and well-being of the communities in which the interventions took place. Such successes are cherry-picked by proponents of participatory conservation as anecdotal case studies; however, at closer inspection, they appear crucially depending on the temporary contingencies of local history (Garnett et al 2007, Murphree 2002).

In academic literature, participatory conservation projects are objects of critiques both from a theoretical point of view and on the basis of empirical findings (Blaikie 2006, Herrold-Menzies 2006, Hsing-Sheng 2007, Galvin and Haller 2008, Vallino 2009, Vallino 2013, Gasteyer et al. 2016). Several authors argue that the trade-off between conservation and development goals is unavoidable (Barrett and Arcese 1995, Hsing-Sheng 2007), especially in settings with very low-income rural areas (Bulte and Van Soest 2001). For instance, the goals of wildlife conservation and that of income generation from wildlife-based activities are often mutually exclusive (Barret and Arcese 1995, Oates 1999, Wunder 2001, Kideghesho 2008, Kovacs et al. 2016). Others highlight that the existence and the magnitude of the trade-off depends on the specificities of the local context, thus advocating against broad generalizations (Koop and Tole 1999, Kovacs et al. 2016). In some cases, conservation and economic development might be complementary and the dynamics of the interaction between the advancements in the two dimensions is highly context-specific (Van Laerhoven and Ostrom 2007, Berkes 2007, Garnett et al. 2007, Platteau 2008).

Often, the *de facto* prevailing approach is still the top-down one, with the role of indigenous communities and their knowledge remaining neglected (Fairhead and Leach 1996, Gibson 1999, Blaikie 2006, Zougouri 2006, Reid et al. 2016). In part, this is justified by the fact that the local decision-making institutions are fragile (Balint 2006). In addition, the attempts to building sustainable income-generation alternatives based uniquely on nature or wildlife rely excessively on earnings from tourism activities, which are often highly volatile (Brown 1998).

Finally, the political-economy dimension of the problem is also key, as conflicts between users and stakeholders frequently emerge at different levels. For instance, local users of a forest may favor resource extraction to satisfy their livelihood needs, whereas the international stakeholders may push for forest conservation for carbon storage (Dolsak & Ostrom, 2003). Given their poverty, indigenous communities in developing countries feel crucially in need of rapid economic improvements of their conditions from conservation and tourism activities (Dhakal et al. 2012). On the other hand, conservation-oriented NGOs are primarily interested in diminishing the level of resource extraction within the conservation zone, giving less weight to the economic considerations of the local community (Coria and Calfucura 2011, Reid et al. 2016). Auer (2006: 217) states that “these and other potentially confounding problems pose challenges for even the best-managed common pool resources, and some of these factors may be beyond the control of local users, rule-makers, and rule-enforcers”.

This paper builds an economic model explaining why participatory conservation emerged, why it failed in various contexts, and why environmental NGOs face difficulties in making it function. To the best of our knowledge, this is the first paper that builds a theoretical model analyzing the contradictions of participatory conservation coming from the interaction between the incentives of local communities, NGOs, and donors. Our explanation focuses on the interplay between the incompleteness of contracts (between the conservation-oriented NGO and the local community) and the narrow mission of the NGO. The main mechanism of the model is as follows. The tragedy of the commons (involving community members) in a given natural area justifies an outside (NGO) intervention. The NGO tries to create incentives for conservation efforts from the local stakeholders; however, the contractual incompleteness calls for transferring property rights over the conservation area to the local community (i.e. participatory conservation). The community members allocate their time between agriculture and hunting (which is harmful for conservation). They rationally choose to refrain from conservation unless the NGO allocates a sufficient amount of resources to sustaining agriculture (increasing returns to agricultural activity). However, the NGO – being funded by donors with strictly environmental motivation – finds it hard to justify diverting a part of funds into agriculture and risks donor alienation if it follows such a practice. Thus, the NGO ends up facing the "size versus efficiency" dilemma: it can either conserve poorly a relatively large area (with non-cooperating local communities but more satisfied donors) or conserve better a smaller area (with cooperation by local communities but (some) alienation of donors).

2. The model

2.1. Setup

Consider a simple model of the tragedy of the commons (Hardin 1968) in a community consisting of two identical farmers ($J = A, B$) and a project by an outside environmental non-governmental organization (NGO), whose main motivation is environmental conservation. The livelihood of the farmers is based on agriculture and other subsistence activities (as explained below). Let's assume that farmers are unable to build binding cooperative agreements (otherwise, the economic problem would be assumed away); thus, in the absence of an outside intervention, a sub-optimal (excessive) use of the natural resource would occur.

For simplicity, we abstract away from the internal dynamics of the farmers' community and restrict the sharing of benefits of the project to a simple equal-sharing rule.[1]

The community is surrounded by a natural habitat (e.g. a forest inhabited by wildlife), that the NGO, driven by its environmental-conservation motivation, would like to transform into a protected zone.[2] The economy consists of three sectors: agriculture, conservation (if the NGO project takes place), and other subsistence activities of the farmers, which we label as "hunting" (but that more broadly can include harvesting of fruits and plants, grazing, fishing, and other activities that provide revenue to community members but harm conservation). Each farmer has one unit of time. The farmer allocates his time budget between agriculture and hunting, so as to diversify income (see, e.g., Lambin and Meyfroidt 2010). Denote with t_a^J and t_h^J the time that farmer *J* allocates to agriculture and hunting, respectively.

Technologies of production in agriculture and hunting are as follows. With probability $1-p_a$ the harvest is bad and the farmer's income from agriculture is low (normalized to zero). With probability p_a, the harvest is good, in which case the agricultural output of farmer *J* is determined by a production function of the form $\beta_0 (t_a^J)^\alpha$, where $0 < \alpha \le 1$ and β_0 is a parameter capturing the productivity of agriculture (in the absence of outside intervention).

For the hunting activity, a poor outcome ("bad year") occurs with probability $1-p_h$, in which case the income from hunting is zero. With probability p_h, a good outcome ("good year") occurs, and the farmer *A*'s income from hunting equals $Q\frac{t_h^A}{t_h^A + t_h^B}$, where *Q* denotes the

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[1] Clearly, there might be a considerable inequality among the community members and thus local elite capture might arise. These issues of interactions between the community members have been widely studied (see, for instance, Platteau 2004, Platteau and Abraham 2002, Platteau and Gaspart 2003, Winkler 2011, Tarui 2007, Gardner et al. 2000, Alix-Garcia 2008, Platteau and Seki 2007). However, given that development practitioners (e.g., Campbell and Vainio-Mattila 2003) argue that studies of interaction between project beneficiaries and project designers are scarce, in this paper we focus on this specific dimension of the problem, keeping aside the distributional issues.

[2] For a good review of the literature on interventions of this kind, see Winkler (2011). The principal contributions are Gordon (1954), Skonhoft (1998, 2007), Smith (2002), Johannesen and Skonhoft (2005), and Fischer et al. (2009).

carrying capacity of the environment in terms of wildlife resources (the expression for farmer *B* is analogous). The probability distributions of outcomes in hunting and agriculture are assumed to be independent. Notice that the good year's income from hunting has the form of a contest success function (Tullock 1980, Perez-Castrillo and Verdier 1992); we impose this form to capture in a simple way the idea that the income-generating activity that harms conservation is subject to competition between farmers.

2.2. Community in the absence of the NGO project

We start by analyzing the setting in which the environmental NGO is absent. Farmer *A* decides on the allocation of his time, so as to maximize his utility:

$$\underset{t_a^A, t_h^A}{Max}\; p_a \beta_0 (t_a^A)^\alpha + p_h Q \frac{t_h^A}{t_h^A + t_h^B}, \qquad \text{subject to } \; t_a^A + t_h^A = 1. \tag{1}$$

The problem (1) reduces to an equivalent unconstrained-optimization problem

$$\underset{t_h^A}{Max}\; p_a \beta_0 (1 - t_h^A)^\alpha + p_h Q \frac{t_h^A}{t_h^A + t_h^B}. \tag{2}$$

The first-order condition of this problem is

$$p_a \beta_0 \alpha (1 - t_h^A)^{\alpha - 1} = p_h Q \frac{t_h^B}{(t_h^A + t_h^B)^2}. \tag{3}$$

The left-hand side (farmer *A*'s marginal cost of hunting time) is the opportunity cost of the marginal unit of time spent for his agricultural activity, which increases with the productivity of agriculture (β_0). The right-hand side (the marginal benefit of hunting) depends instead on the hunting effort of farmer *B*, as well as on the carrying capacity (the quantity of the natural resource available) *Q*.

Given that farmer *B*'s problem is symmetric, we obtain the following best-response functions

$$t_h^{A*} = f(\beta_0, t_h^B) \;\text{ and }\; t_h^{B*} = f(\beta_0, t_h^A). \tag{4}$$

Solving the system of equations (4), we obtain the Nash equilibrium in hunting efforts of the two farmers, in the absence of NGO intervention.

To understand the shape of the reaction functions, let's write the net marginal benefit of hunting for farmer *A* (denoting it with Y^A):

$$Y^A = p_h Q \frac{t_h^B}{(t_h^A + t_h^B)^2} - p_a \beta_0 \alpha (1 - t_h^A)^{\alpha - 1} = 0 . \quad (5)$$

Applying the implicit function theorem to the function $Y^A(t_h^A, t_h^B)$, we get

$$\frac{\partial t_h^A}{\partial t_h^B} == -\frac{\partial Y^A / \partial t_h^B}{\partial Y^A / \partial t_h^A} = \frac{p_h Q (t_h^A - t_h^B)}{2 p_h Q t_h^B + p_a \beta_0 \alpha (1-\alpha)(1 - t_h^A)^{\alpha - 2} (t_h^A + t_h^B)^3} , \quad (6)$$

which describes the slope of the best-response function of farmer *A* (an analogous expression obtains for the slope of the best-response function of *B)*. Figure 1 presents the best-response function curves and the Nash equilibrium. Notice that given the functional form assumptions, the best-response functions are concave, the equilibrium is unique and symmetric, and the slopes of the two curves are zero at the equilibrium.[3]

The intuition is as follows. Consider farmer *A*'s choice of time allocation. If his rival were to devote no time to hunting, the marginal benefit of hunting time for A would be extremely high (a tiny quantity of hunting time would give farmer *A* the entire carrying capacity). As the rival increases his hunting time, farmer A also has the incentive to increase t_h^A, but at an ever decreasing rate. This occurs for two reasons: (1) the opportunity cost of hunting time (the returns from agriculture) grows, driven by the diminishing marginal returns to time for agriculture, and (2) the marginal returns to hunting time are lower at higher values of hunting activity of the rival (by the nature of the contest success function). Beyond a certain point, the first effect outweighs the second, so that if the rival increases his hunting time even further, then farmer *A* is better off reducing his hunting effort. The symmetry of the objective functions of the two farmers implies then that both farmers rationally expect the rival to

[3] This is generally true in rent-seeking games which are modelled as contests (see Perez-Castrillo and Verdier 1992).

choose the level of hunting effort exactly at the point where the two effects described above cancel each other.

The symmetry of the Nash equilibrium allows us to pin down the equilibrium symmetric value of the net marginal benefit of hunting:

$$Y^* = p_h Q \frac{1}{4t_h^*} - p_a \beta_0 \alpha (1 - t_h^*)^{\alpha - 1} = 0\,. \tag{7}$$

Applying the implicit function theorem to this expression, we obtain the following simple comparative statics result:

Proposition 1. An increase in the carrying capacity of the natural area or an increase in the probability of the "good hunting year" raises the total equilibrium hunting activity. An increase in probability of the good agricultural harvest, in agricultural productivity parameter, or slowdown in the speed of diminishing marginal returns to agriculture time decreases the total equilibrium hunting:

$$t_h^* = t_h^*(\overset{+}{p_h}, \overset{+}{Q}, \overset{-}{p_a}, \overset{-}{\beta_0}, \overset{-}{\alpha}).$$

The intuition for this result is straightforward. Anything that increases the expected return to hunting activity, ceteris paribus, raises the marginal benefit of hunting time. Time devoted to hunting by the two farmers exhibits strategic complementarity up to the point of Nash equilibrium, i.e. when the return to hunting activity increases, the net marginal benefit from time spent hunting by farmer *A* becomes temporarily increasing in the hunting time of farmer *B*, and vice versa. This induces both farmers to allocate more time to hunting. Similarly, anything that increases the expected return to agriculture, ceteris paribus, increases the opportunity cost of hunting. Time devoted to hunting by the two farmers exhibits strategic substitutability beyond the point of Nash equilibrium, i.e. when the opportunity cost of hunting increases, the net marginal benefit from time spent hunting by farmer *A* becomes temporarily decreasing in the hunting time of farmer *B*, and vice versa. This induces both farmers to allocate less time to hunting (as shown by dashed lines on Figure 1).

[INSERT FIGURE 1 ABOUT HERE]

2.3. Community with NGO under complete contracts

The above analysis indicates that the Nash equilibrium played by farmers *A* and *B* exhibits the tragedy of the commons in hunting activity. Since we assume away the possibility for the farmers to write binding cooperative agreements, an outside actor interested in conservation may consider an external intervention necessary to modify the farmers' incentives and behavior. Consider now the setting in which an outside environmental non-governmental organization (NGO) enters the community with a conservation project. The NGO has funds (collected from donations in a developed country), its broad mission is to maximize conservation, and its project ("narrow mission") consists of establishing a protected area and of encouraging the farmers to abstain from hunting (pursued within the boundaries of the zone that needs to be conserved).

As a benchmark, suppose that complete contracts between the NGO and farmers are feasible. Denote with *e* is the mission-oriented expenditure by the NGO (e.g. creating and maintaining the protected area, investing into persuasion campaigns aimed at farmers, etc.). The NGO's objective is

$$\underset{e}{Max}\, Q - \gamma \sum t_h(e) \tag{8}$$

where γ is a parameter capturing the (irreversible) damage done to the environment by hunting.[4] Since *Q* and γ are constant, this problem is equivalent to

$$\underset{e}{Min} \sum t_h(e) \tag{9}$$

Assuming complete contracts, the NGO can perfectly observe the behavior of farmers and can enforce (at no cost) the actions agreed upon (see Laffont and Martimort 2002). In such an environment, the NGO proposes a payment scheme to the farmers: a lump-sum transfer *w*, paid out conditional on the level of hunting, similar to the widely-known payments for environmental services (PES; see, e.g., Engel and Palmer 2008). More specifically, the scheme can take the form: w^{high} if $t_h = 0$ and w^{low} if $t_h > 0$.

[4] Given that we abstract from dynamic considerations, we suppose that *Q* is constant (equivalent to the steady-state value in a dynamic model).

What should be the values of *w* such that the farmers prefer to accept the payment scheme?[5] If farmers reject the offer, they would play the Nash equilibrium derived above, t_h^*. This gives each of them their symmetric Nash-equilibrium payoffs

$$p_a\beta_0(1-t_h^*)^\alpha + p_hQ\frac{t_h^*}{\sum t_h^*} = p_a\beta_0(1-t_h^*)^\alpha + \frac{p_hQ}{2} \tag{10}$$

If a farmer accepts the payment and thus chooses $t_h = 0$, his payoff becomes

$$p_a\beta_0 + w^{high}. \tag{11}$$

Consequently, the farmers accept the payment scheme if and only if

$$w^{high} \geq \frac{p_hQ}{2} - p_a\beta_0\left[1-(1-t_h^*)^\alpha\right] \tag{12}$$

Suppose that the NGO obtains external funds (from donations or grants), denoted with *F*, as well as the entire income derived from the conservation area (e.g. tourism revenue from the natural park), which we denote, per unit of carrying capacity, as *R*. Being a non-profit organization, the NGO has to satisfy the non-distribution constraint (see Hansmann 1980), which states that it cannot distribute profits; in other words, its revenue has to be spent to cover its costs. Assume that the NGO proposes the payment w^{high} that satisfy (12) with equality. Then, the non-distribution constraint of the NGO becomes

$$QR + F = 2w^{high} = p_hQ - 2p_a\beta_0\left[1-(1-t_h^*)^\alpha\right].$$

In other words, the minimum amount of external funds that the NGO needs under complete contracts to implement efficient conservation is

$$F_{\min} = Q(p_h - R) - 2p_a\beta_0\left[1-(1-t_h^*)^\alpha\right]. \tag{13}$$

[5] Given that the contracts are complete, the only individual-rationality constraint is the participation constraint (Laffont and Martimort 2002), i.e. an incentive-compatibility constraint is unnecessary, since the behavior is fully observable.

2.4. Participatory conservation: the rationale and inefficiency

Classic results in economic theory state that if contracts are incomplete, the ownership of productive assets matters crucially for efficiency (Grossman and Hart 1986; Besley and Ghatak 2001). In the settings that we focus on, the contracts between (Northern) NGOs and Southern beneficiaries are severely incomplete, because of both strong informational asymmetries and enforcement problems (Baland and Platteau 1996; Werker and Ahmed 2008).

This provides the main rationale for participatory conservation. If the NGO is the sole owner of the conservation area and all the income from the area accrues to the NGO, in the absence of complete contracts, the farmers have little interest in putting effort into the project. However, their effort (e.g. abstaining from hunting) is fundamental for the project's success. Plenty of empirical evidence supports this by demonstrating the failure of "top-down" approaches in the management of protected areas, given the difficulty of effective monitoring and enforcement in developing-country contexts (Galvin and Haller 2008, Garnett et al. 2007). The development practitioners generally agree that direct participation of project beneficiaries improves project performance (Ishamn et al. 1995; Brosius et al. 2005). For these reasons, the NGO might prefer to transfer the property rights (although without the right to sell) over the conservation area to the local community, so as to provide the community members with the appropriate incentives to provide conservation effort. This transfer implies that the revenue (e.g. from tourism) accrues to the local community. Thus, the rest of our analysis relies on two elements of the same mechanism: (1) if the productivity of agriculture is sufficiently low, the farmers do not restrain hunting; (2) if the productivity in the agricultural sector increases sufficiently, the farmers start to put positive conservation effort (i.e. restrain hunting).

Ample evidence supports both of these elements:

1a. In the short run, the income from tourism in participatory conservation projects may not exceed the opportunity cost of land. This has been extensively documented by case studies of participatory conservation initiatives worldwide (for reviews, see Galvin and Haller 2008, Garnett et al 2007). In areas in which the park-related tourism potential is low (for example, Western Africa), while sharing the benefits derived from natural parks and wildlife with local project beneficiaries has improved the revenue flows of the latter, the available evidence indicates that rural population loses out in economic terms when protected areas are established and wildlife becomes protected (Emerton 2001, Muchapondwa et al. 2006, Vallino 2009, Smith et al. 2009, Coria and Calfucura 2011). Brown (1998: 4) states that "while one cannot entirely exclude tourism from the range of options open to governments wishing to promote conservation with development, its role can be easily overrated, and it is unlikely to provide the panacea for biodiversity conservation in many parts of Africa". In Western Africa, scholars have documented a number of structural shortcomings regarding nature and wildlife-based tourism. These include the severe lack of infrastructure, shortage of wild game as compared to Eastern and Southern Africa, and limited capacity of national and local governments to make significant investments in the tourism industry (Brown 1998, Vallino 2009). Moreover, some authors find that only a fraction of revenue from participatory conservation projects actually reaches the community members, further reducing the incentives for of the local population to change their habits regarding hunting and harvesting (see Winkler 2011, Barrett and Arcese 1995, Bookbinder et al. 1998, Gibson and Marks 1995, Wells et al. 1992), while the rest going to the NGO to cover its operation expenses, to the local government in the form of taxes, etc. (Calfucura 2018).

1b. In the long run, although income from tourism increases in case the project is successful, the local population living close to subsistence may not be able to afford the possibility of deferring the satisfaction of basic needs to the future (Baland and Platteau 1996, Baland and Francois 2005, Dhakal et al. 2012). Baland and Platteau (1996: 19) state that "(…) agents who live close to their subsistence level and have no alternative income-earning opportunities, are concerned that the income they derive from exploitation of the resource meets their subsistence requirement *in each period*. If the conservation of the resource involves costly investments that have a long gestation period, it may happen that they are not able to bear such a sacrifice". This concern is closely linked to the broader issue of land management in such contexts (see, e.g., Calfucura 2018). Vermeulen (2004) discusses the example of the *Parc W* in West Africa, where violent land disputes are frequent and food crops in agriculture already compete with cash crops, grazing, hunting and harvesting activities. He argues against adding a further land-intensive activity such as safari hunting for tourism, even if this latter would be conducted in a participatory way.

Moreover, income from agriculture is individual, whereas tourism income is usually channeled to the community as a whole and collective incentives may often be ineffective (Gibson 1999, Hulme and Murphree 2001, Galvin and Haller 2008: 21, Smith et al 2009). The creation of a community forest whose aim is commercial and tourism revenue for the benefit of the community often implies delimiting land areas on spaces that up to that point have been exploited and managed by individual households. This may create additional transaction costs, if the community does not have sufficiently developed institutional arrangements for decentralization and participation (Joiris and Bigombé Logo 2008: 28, Borrini-Feyerabend 2000).

Finally, poor farmers in developing countries are usually highly risk averse. Tourism income is typically more volatile than the one from agriculture, because it is subject to the international fluctuations of the recreation industry (Barrett and Arcese 1995, Brown 1998, Dansero 2010: 434, Coria and Calfucura 2011). This might discourage local farmers from relying on tourism revenue as a reliable source of income.

2. The productivity increases in agriculture induce farmers to devote more effort to conservation. This essentially relies on the well-known "Borlaug hypothesis", i.e. that increasing the productivity of agriculture on the best farmland can help control deforestation by reducing the demand for new farmland (Borlaug 2000, Borlaug 2007; see also Angelsen and Kaimowitz 2001, Angelsen and Kaimowitz 2001a). Agricultural intensification triggers two opposed forces, one that increases and another that reduces cultivated surfaces (Rudel et al 2009). Intensified production allows farmers to have higher yields per hectare and thus a higher (gross) income, and this would induce farmers to expand the cultivated area. However, if demand for the food products is relatively inelastic, the increase in supply will result in a strong decline in crop prices and this effect may result in reduction of cultivated surface. The increased yields that set these processes in motion may have origins from changes in technology, but also from the knowledge that farmers accumulate about specific plots of land, since they would abandon their less-productive fields. The lands abandoned by farmers have the

potential to become places that provide enhanced environmental services and face an increase in forest cover (Walker 1993, Mather and Needle 1998, Waggoner and Ausubel 2001, Matson and Vitousek 2006, Borlaug 2007, Pascual and Martinez-Espineira 2009, Baland et al. 2018). On the contrary, if demand is sufficiently elastic, the increase in supply does not lead to a price decline and the overall incentive for higher production by using more land remains in place (Rudel et al 2009). Empirical studies provide evidence for both land-consuming and land-sparing effects (Tachibana and Nguyen 2001, Pascual and Barbier 2006; Shively and Martinez 2001, Kaimowitz and Smith 2001, Coxhead et al 2001, Meyfroidt and Lambin 2007, Angelsen and Kaimowitz 2001: 404-407), depending on the context and on the type of technology applied[6]. Finally, from the political point of view, Rudel et al (2009) underline that "both reducing emissions from deforestation (...) and payments for environmental services on abandoned agricultural lands only become politically acceptable policy options when crop yields rise on the remaining lands".

Let us formalize the core of the above discussion in the framework of our simple model. Assume that the NGO has F units of resources (external funds) and denote with e denote the amount used for agricultural support (i.e. F-e are funds devoted to environmental conservation). The NGO expenditures in agriculture influences the net marginal benefit of hunting activity of the farmers, which, in turn, determines the level of conservation and therefore the final outcome of the participatory conservation project.

The property over the conservation area is transferred to the farmers (collectively), i.e. they become the claimants of its revenues. We also assume that the output of the conservation area (e.g. quality and quantity of the environment/wildlife) is described by the Cobb-Douglas production function with NGO environmental expenses and the carrying capacity (net of hunting) as inputs: $(F-e)(Q-\gamma\sum t_h)$.

[6] Angelsen and Kaimowitz (2001a) offer a detailed study on the links between improvements in agricultural techniques and consequent impact on the environment, on land management and on forest cover, both in developed and developing countries. For issues on land use transition and deforestation, see also Lambin and Meyfroidt (2010).

The agricultural productivity depend positively on the NGO's expenses for agricultural extension, and has the following form $\beta(e) = \beta_0 + \beta_1(e)$, with $\beta_1' > 0$. Let's assume that the impact of agricultural extension expenses on the productivity is negligibly small up to a certain level, and has the usual concave shape afterwards. For instance, it can have the usual S-shaped form (similar to the one in Foster and Rosenzweig 1995, among others) or contain a non-divisibility.[7]

As before, the NGO's objective is to maximize conservation, i.e. $\underset{e}{Min} \sum t_h(e)$. The timing of the game is: (1) the NGO commits the amount of resources *e* to agriculture; the remaining part goes to the conservation; (2) the farmers observe *e* and decide on their allocation of time.

Let's assume that the two farmers split the revenue from tourism equally. The utility-maximization problem of farmer *A* becomes:

$$\underset{t_h^A}{Max}\; p_a \beta(e)(t_a^A)^{\alpha} + p_h Q \frac{t_h^A}{t_h^A + t_h^B} + \frac{(F-e)(Q - \gamma \sum t_h)R}{2},$$

subject to $t_a^A + t_h^A = 1$. (14)

Here, *R* is the tourism revenue per unit of the production output of the natural park, and thus the last term in the objective function describes *A*'s revenue from tourism.

The first-order condition of the corresponding unconstrained-optimization problem is:

$$p_a \beta_0 \alpha (1 - t_h^A)^{\alpha - 1} + p_a \beta_1(e) \alpha (1 - t_h^A)^{\alpha - 1} + \frac{(F-e)R\gamma}{2} = p_h Q \frac{t_h^B}{(t_h^A + t_h^B)^2} \;. \quad (15)$$

Let's denote with $t_h^{*N,e}$ the equilibrium (individual) level of hunting, when the NGO spends *e* for agricultural extension. When *e*=0, i.e. the NGO devotes all its resources to conservation, the amount of hunting time that equates the marginal benefit of hunting to its marginal cost is $t_h^{*N,0}$. As *e* increases, the marginal benefit of hunting (described by the right-hand side of

[7] Our main result (concerning the effect of donor financing) holds even for the globally concave function $\beta_1(e)$.

(15)) does not change, whereas the marginal cost decreases (this is because the second term, the effect of agricultural extension expenses on the agricultural productivity increases only gradually, whereas the revenue from the natural park falls linearly). Consequently, equilibrium hunting $t_h^{*N,e}$ increases (as can be seen on Figure 2).

[INSERT FIGURE 2 ABOUT HERE]

As *e* keeps increasing, beyond a certain level (corresponding to point *e** on Figure 2), the effect of agricultural extension on productivity starts to grow and outweighs the linear fall in revenue from the natural park. Therefore, the marginal cost of hunting starts to increase, and the equilibrium (and total) hunting starts to decrease. Note that on Figure 2, such a decrease passes by the point $\bar{e}$, where the total hunting is equal to the level of hunting under *e*=0. In other words, any agricultural-extension spending by the NGO below the level $\bar{e}$ is essentially counter-productive.[8]

As *e* increases further, the decrease in equilibrium hunting continues until the point where the diminishing marginal returns to agricultural-extension bite sufficiently strongly. This is the level where the equilibrium hunting is minimized (corresponding to point e_{min} on Figure 2). Beyond this point, the equilibrium hunting starts to increase again.

Next, let's compare the first-order conditions of farmers, with and without the NGO intervention. Consider first the case in which *e* = 0, i.e. the extreme case in which the NGO creates the conservation area but does not spend anything for agricultural extension. Compare expressions (15) for *e* = 0 and (3):

(With NGO, under *e*=0): $$p_a \beta_0 \alpha (1-t_h^A)^{\alpha-1} + \frac{FR\gamma}{2} = p_h Q \frac{t_h^B}{(t_h^A + t_h^B)^2} \quad (15')$$

(Without NGO): $$p_a \beta_0 \alpha (1-t_h^A)^{\alpha-1} = p_h Q \frac{t_h^B}{(t_h^A + t_h^B)^2}$$

[8] The case of GEPRENAF Project in Burkina Faso illustrates this very clearly. This project had planned some activities for support to the agriculture, but was been implemented with insufficient intensity. It thus created unfulfilled expectations in the local population and resulted in counter-productive effects, as documented in Vallino (2009).

We see that the marginal benefit in the two expressions coincides, while the marginal cost is higher in the setting with the NGO intervention. Consequently, the level of hunting in the situation with the NGO intervention but no expenses in agricultural extension (e = 0), $t_h^{*N,0}$, is lower than the total hunting in the absence of the NGO, t_h^*.

Consider now the corresponding first-order conditions in the opposite extreme case (with the NGO spends everything for the agricultural extension):

(With NGO, under e=F): $p_a \beta_0 \alpha (1-t_h^A)^{\alpha-1} + p_a \beta_1(F) \alpha (1-t_h^A)^{\alpha-1} = p_h Q \dfrac{t_h^B}{(t_h^A + t_h^B)^2}$. (15'')

Again, the marginal benefit of hunting is the same with and without NGO intervention, while the marginal cost is higher in the situation with the NGO. Consequently, the total hunting when the NGO intervenes and spends everything for agricultural extension, $t_h^{*N,F}$, is also lower than in the situation without the NGO.

Finally, comparing the first-order conditions under e = 0 to the one under e = F, we observe that the total hunting might be higher or lower in the former case as compared to the latter. This depends on the magnitudes of R, p_a, and γ: if the unit revenue from tourism (R) or the damage from hunting for the natural park (γ) is sufficiently low, or the likelihood of the good harvest is sufficiently high (p_a), the total hunting under the purely participatory conservation project ($t_h^{*N,0}$) is higher than in the pure agricultural extension project, $t_h^{*N,F}$ (but is still lower than in the absence of the NGO of any project type, t_h^*). The opposite is true if R or γ is sufficiently high, or if p_a is sufficiently low.

Our analysis thus immediately implies the following result:

Proposition 2. An institutional constraint blocking the conservation-oriented NGO from spending on supporting agriculture (e = 0) implies a sub-optimal level of effective conservation (i.e. inefficiently high level of hunting).

It is important to note that multiple authors argued about the importance of allowing conservation NGOs to spend sufficient resources to indirect activities of the project such as agricultural extension. For instance, Garnett et al. (2007) state: "when people are living in extreme poverty, it will usually be more important to invest in their health and education and in the productivity of their agriculture than in the protection of their forests… ICDPs [participatory-conservation projects] have to be based upon an understanding of the states and trends of the capital assets of the concerned populations, and … should be made in ways that lead to balanced and sustainable improvements". Similarly, Brown (1998) explains that the shortfall of income from the alternative income-generating activities feeds hostility by local farmers towards the project and, consequently, increasing the level of NGO investment in enhancing the productivity from the main sources of income (such as agriculture) may effectively limit the external costs of conservation area management.

Why, then, the conservation NGOs are often so reluctant to invest in agricultural extension? One plausible hypothesis is that their funding comes from sources (e.g. private donors in the North) that may be unhappy to know that the NGO spends a part of the donations to activities different from conservation. This might represent an institutional constraint that discourages the NGO from moving away from $e=0$ allocation. The next subsection analyzes this possibility in detail.

2.5. Donor discouragement and NGO's dilemma

The conservation-oriented NGO is typically strictly tied to its "narrow" mission, and its donors' might condition their (current and future) donations to spending the funds of the NGO exclusively for conservation (Garnett et al. 2007, Werker and Ahmed 2008, Azam and Laffont 2003). The NGO therefore faces the dilemma: if it splits its resources between the natural park and agricultural extension, the conservation effort of the local community would be higher, but it risks to alienate its (conservation-motivated) donors. Conversely, investing all of the resources to the park would lead to creation of a large park, but with little conservation effort of the local community, which might increase the risk of failure in the long run.

This dilemma emerges because of the donors' narrow view of local implications of strict environmental policies in poor rural areas of developing countries. In part, such view is itself related to the recent increase in the size and power of international conservation-oriented organizations, which were instrumental in bringing politics into nature-caring issues (Alcorn

2005, Adams and Hutton 2007).[9] Both the NGOs and governmental organizations focused on local or rural development and on community participation realized that they had to broaden their focus and to include environmental concerns into their programs to keep obtaining funding (Garnett et al 2007, Campbell and Vainio-Mattila 2003, Giannini 2011). Angelsen and Kaimowitz (2001a: 403-404) write that "[a] reason why policy-makers should understand how technological change affects forests is that research managers and development agencies increasingly seek to justify their budgets by claiming that their projects help conserve forests. As the world becomes increasingly urban and past scientific breakthroughs allow us to produce more food than markets demand, *political support for agricultural research and technology transfer has declined*. In contrast, public concern about the environment, and tropical forests in particular, has never been stronger".

Surprising as it may be, most (small) donors are strongly attached to their preferred NGO projects and are unwilling to "trade" the non-targeted use of their funds for the broader project efficiency. It is likely that the core donors of a conservation-oriented NGO have environmental motivations and may be more tied, for example, to the protection of certain charismatic species (Tisdell 2007) or to clear earmarking of resources dedicated to conservation (Frontuto et al. 2017) than to a more comprehensive socio-ecological dimension. Therefore, the "warm-glow" feeling that the donors obtain from contributing to the NGO typically increases with the size of the natural area under conservation, and they have relatively low concern for the degree of cooperation from and the well-being of the indigenous community (Garnett et al. 2007, Azam and Laffont 2003). Consequently, the NGO faces a strong incentive to invest more into the natural park than into agriculture. The use of participatory techniques for conservation in order to motivate local population to conserve frequently often becomes a pure rhetoric, which "upon occasion served to help shift resource away from local strategies for livelihood and empowerment toward resource management that serves more powerful institutional interests (…)" and triggered "processes of expropriation, reallocation, and management in which political and economic inequalities are (…) reinforced by programs legitimized through the language of participatory resource"

[9] For a good historical perspective on conservation movements and participatory conservation initiatives, see Alcorn (2005) and Brosius et al. (2005).

(Brosius and Lowenhaupt-Tsing 1998: 6; see also Blaikie 2006, Adams and Hutton 2007). In addition, in the context of the rising competition between NGOs for funding (Aldashev and Verdier 2010; Aldashev and Navarra 2018), most conservation NGOs feel that the risk of alienating their conservation-oriented donors by assuming a more pragmatic mixed approach is extremely high.

To analyze this problem, we extend the model of the previous section, by endogenizing the funding of the NGO as follows. Consider a continuum of size 1 of small (atomistic) donors that care about environment, and denote an individual donor with *i*. Each donor has an (indivisible) unit of resource. Consuming this resource provides the donor with utility $\underline{u}$, whereas donating it to the conservation NGO gives the donor the level of utility $u(e)G_i$, where G_i is the individual characteristic capturing the intensity of warm-glow utility of giving, which we assume for simplicity to be randomly uniformly distributed on the interval $[0,1]$. To capture the idea that donors are alienated by NGO expenditures to non-conservation activities, we assume $u'(e)<0$. Also, let the NGO have its own funds (or funds coming from unconditional government grants) equal to F_0.

The timing of the game is as follows:

(1) NGO commits to how it plans to allocate its resources between conservation and agricultural extension (choice of *e*);
(2) Each donor *i* decides on whether to give its unit of resource to the NGO or to consume it;
(3) NGO uses the collected funds to create the natural park, and transfers the ownership to farmers. Each farmer decides on its allocation of time between hunting and agriculture.

Using backward induction, at stage (3), the farmers' decision concerning the allocation of time is described by the first-order condition (15), and thus the level of hunting is $t_h^{*N,e}$. At stage (2), the donors that decide to give to the NGO are those for whom the condition $\underline{u} \leq u(e)G_i$ holds. Given the uniform distribution assumption, this means that the mass of donors (and total donations) equals $1-\frac{\underline{u}}{u(e)}$.

This implies that at stage (1) the total funds that NGO can raise is

$$F = F_0 + 1 - \frac{\underline{u}}{u(e)}. \quad (16)$$

Note that the total funds of the NGO are now decreasing in its expenditures for agricultural extension:

$$\frac{\partial F}{\partial e} = \frac{\underline{u}}{[u(e)]^2} u'(e) < 0. \quad (17)$$

This represents the institutional constraint that we mentioned above, and where $u'(e)$ represents how strictly conservationists are the donors, i.e. how harshly the donors penalize the NGO for using funds beyond its narrow mission.

At stage (1), the problem of the NGO now becomes:

$\underset{e}{Min} \sum t_h^{*N,e}(e)$, subject to (15) and (16).

[INSERT FIGURE 3 ABOUT HERE]

The solution of this problem is described by Figure 3. Let NGO commit at stage 1 to no spending for agricultural extension (e=0). It would then collect the amount of funds equal to *F(0)*. The (hypothetical) total hunting curve (describing total hunting as a function of e) corresponding to this amount of funds is the lowest in the family of curves on Figure 3, and the point *A* (corresponding to the level e=0) is the resulting equilibrium in the subsequent game. Suppose instead the NGO commits to the level $e=e_1$. The amount of funds it collects would fall to $F(e_1)$. The (hypothetical) total hunting curve corresponding to funds $F(e_1)$ lies a bit above, as the reduction of the funds would constrain the NGO to carry out a smaller project. Point *B* (corresponding to the level $e=e_1$) is the resulting equilibrium in the subsequent game. In the analogous manner, we construct the points *C*, *D*, and *E*. The NGO's optimal decision at stage 1 thus implies choosing the level of e corresponding to the lowest point on the resulting curve $T_h^*(e)$, which for the case described by Figure 3 corresponds to level $e=e_3$.

Clearly, how rapidly the (hypothetical) total hunting curve shifts up is determined by the degree of conservationism of the donors, $u'(e)$. We thus obtain the following

Proposition 3. (a) If the donors are mildly conservationist (i.e. the penalty $u'(e)$ imposed on the NGO for deviating from its narrow mission is sufficiently small), the NGO uses a part of its funds to increase the productivity of agriculture ($e>0$). The conservation area is smaller than the maximum that the NGO can create, but the total hunting is effectively restrained. **(b)** If the donors are strictly conservationist (i.e. the penalty $u'(e)$ imposed on the NGO for deviating from its narrow mission is sufficiently large), the NGO uses all of its funds for conservation ($e=0$). The conservation area is the maximum that the NGO can create, but the total hunting is relatively poorly restrained.

3. Conclusion

Participatory conservation is a powerful concept that has been designed in national and international development programs, based on the goal of combining economic development with nature conservation. One of the pillars of this concept is direct involvement of local communities in conservation activities. This paper has developed a theoretical model that links the rationale for participatory conservation, the mechanisms behind its inefficiencies in terms of nature conservation, and the institutional difficulties encountered by conservation NGOs in balancing between the optimal approach to conservation and the risk of donor discouragement. Our main finding is that, ideally, the conservation-oriented NGO must deviate from its narrow mission in order to reach it, which puts the NGO in front of a dilemma. On the one hand, the NGO might have an incentive to invest into agricultural extension (which would generate incentives for the local community to collaborate more actively in conservation efforts); on the other, the NGO must stick to its narrow environmental mission in order to secure funding from its environmental-oriented donors.

Intuitively, the revenue from tourism plays the key role for the main mechanism of the model. Higher revenue would naturally reduce the inefficiency; however, this may still not completely solve the problem. In a wider sense, effective conservation projects should invest in “enhancing, rather than replacing, existing livelihoods” (Brown 1998: 4), i.e. should provide tourism revenue as a complement (rather than a substitute) to the existing income flows of the community. Since tourism may be highly volatile in some contexts, due to a combination of factors such as variability of valuable natural features and species, lack of infrastructure, political instability, it should not be considered as the main source of socio-economic development of indigenous communities. Numerous development practitioners have highlighted that income from participatory conservation should not be a substitute for broader commitment by NGOs and government agencies to address the basic problems and demands faced by local communities (Garnett et al. 2007; Berkes 2007; Coria and Calfucura 2011).

More generally, our analysis contributes to understanding the consequences of the decentralized organization of development cooperation, of which this study is an example in an environmental context. One major characteristic of such organization, namely competition for donations, has been already analyzed quite extensively (see Aldashev and Verdier 2010; Ghosh and Van Tassel 2012; Heyes and Martin 2016; Aldashev et al. 2017; among others). The analysis in this paper illustrates that another major feature, namely “upstream” accountability of NGOs (i.e. towards donors and not towards beneficiaries), might also be a key source of inefficiency in the functioning of development cooperation.

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Figure 1. Nash equilibrium hunting without NGO

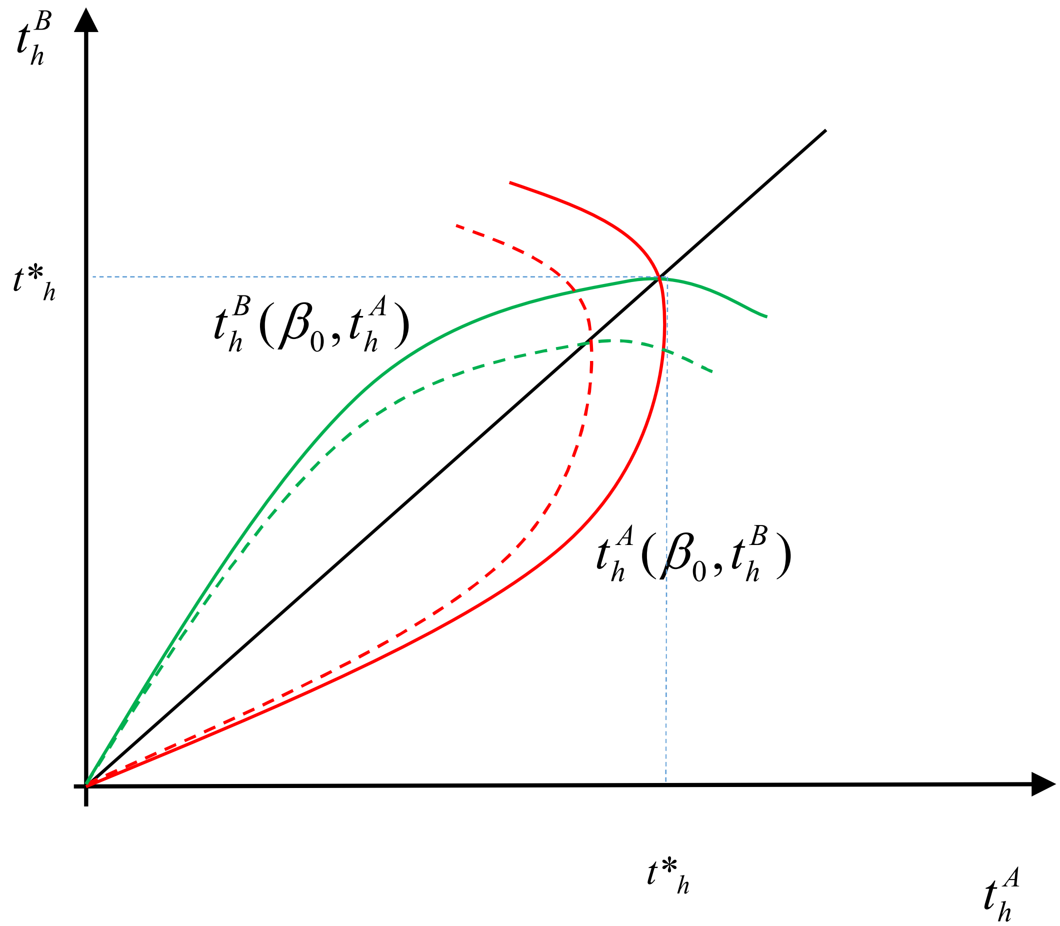

Figure 2. NGO's allocation of funds and equilibrium hunting

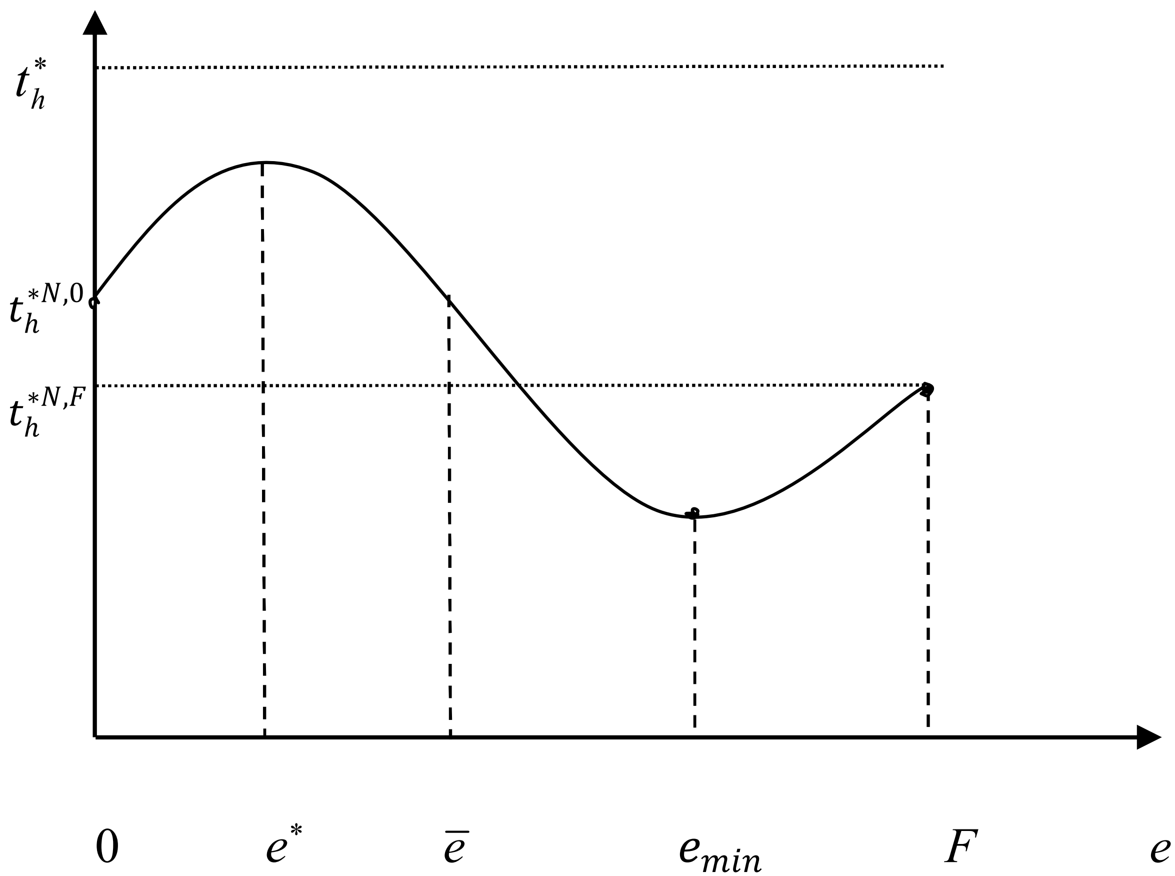

Figure 3. Endogenous NGO funds and total hunting