The dilemma of NGOs and participatory conservation

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Abstract

Participatory conservation projects imply direct involvement of local communities in natural conservation efforts, aiming at combining economic development with protecting the environment. NGOs engaged in both development and conservation massively implement such projects. Numerous field studies document mixed results of such projects and the persistence of conservation-development tradeoff: better conservation comes at the expense of lowering the livelihoods of community members because they have to abstain from using the conservation area for hunting or agriculture. Economists argue that transferring property rights to relevant stakeholders would provide the right incentives for escaping this tradeoff. We build a simple model explaining why this policy might be insufficient. If the revenue from the conservation project is low and/or volatile, the community members may rationally reject conservation unless the NGO allocates a part of resources to sustaining community livelihoods (e.g. by agricultural extension). Hence, the NGO should deviate from its narrow mission to reach its broader objective. If the NGO is funded by strictly environmentally-oriented donors it may struggle to justify diverting a part of resources to agricultural extension, as such donors obtain little "warm-glow" utility from giving to the NGO that substantially engages in non-core mission activities. Thus, the NGO faces a "size versus efficiency" dilemma: poorly conserving a larger area (with non-cooperating local communities but happier donors) or conserving well a smaller area (with cooperation by local communities but keeping donors unsatisfied).

Keywords: Participatory conservation, NGOs, local development, land use, agriculture

JEL codes: L31; O19; O13; Q15; Q26.

1. Introduction

In the past several decades two large trends 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). In the implementation phases projects managers apply a wide spectrum of participation concepts, ranging from mere community consultation to effective involvement in decision-making (Bixler et al. 2015). However, the shared final aim of this approach is to increase beneficiaries' incentives and motivations to behave in ways that lead to improvement of project outcomes. The second is that the objective of environmental sustainability and conservation can, and should, be coupled with economic development (Garnett et al. 2007). Scholars and practitioners provide different arguments: first a moral one, according to which poverty alleviation should be prioritized even if conservation needs are in place. Second, a utilitaristic one: strict "no-resource-use" and "fines and fences" policies with respect to protected areas in the long run harms conservation because it creates hostility from the poor local community and strong incentives for rules violation. Improvements in local income are supposed to increase community commitment to conservation (Adams and Hutton 2007). Additionally, in many contexts, participation is considered one of the most effective channels to solve the development-conservation trade-off (Bixler et al. 2015). As a consequence, one observes 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. In turn the community is expected to consistently decrease the exploitation of the resources that are supposed to be conserved. 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 it has been extensively studied by scholars from several disciplines (Gasteyer et al. 2016, Reid et al. 2016, Bouamrane et al. 2016, Agrawal et al. 2018).

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 build a theoretical economic model analyzing the contradictions of participatory conservation coming from the interaction between the incentives of local communities, NGOs, and donors. When facing the tradeoff between environment conservation and local economic development, a standard response from some streams of economic theory would recommend to transfer property rights to the local community over the endangered area and this would provide them sufficient pecuniary incentives to solve the tradeoff. However, as we will explain extensively in the next sections, numerous case studies conducted by scholars of different disciplines worldwide show that this schema does not perform as intended, mainly because the income generated by the resources over which the community gained property rights is either too low or too volatile or can not act a substitute for traditional livelihood sources. We show, from the economics perspective, why such contradictions emerge and why bottlenecks placed in the relation between the environmentally oriented NGO and its

myopic donors hinders a straight solution. 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. We discuss several practical implications on the field of these reflections. We hope that our analysis will interest scholars and practitioners from disciplines beyond economics, that deal with participatory conservation projects at different decisions levels.

The main mechanism of the model is as follows. The tragedy of the commons in a given natural area justifies an outside (NGO) intervention. The NGO tries to create incentives for conservation efforts from the local stakeholders; however, according to economic theory the contractual incompleteness calls for transferring property rights over the conservation area to the local community (i.e. participatory conservation). This necessity arises because the NGO is not able to fully control farmers' behavior. Therefore, farmers need a direct incentive to behave in the way that the NGO desires in order to reach project objectives. In the schema the community is expected to strongly (although not completely) decrease the activities within the protected zone and in turn they are granted with the right to receive the tourism income generated from the conservation project. However, the community members are close to the subsistence level and are thus highly risk-averse. Consequently, they give priority to agricultural income over the more volatile tourism revenue from the conservation project. We will argue that in rural areas where livelihood is close to subsistence, this holds also in case the tourism industry promises future good performance. Thus, they rationally choose to refrain from conservation unless the NGO allocates a sufficient amount of resources to sustaining agriculture (which is expected to take place outside the park). 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 a reduction of donors funds if it follows this 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 it can conserve better a smaller area (with cooperation by local communities but reducing the welfare of donors because of funds diversion)[1].

In order to improve the model understanding, we provide here more background on participatory conservation (PC), on its analysis in the academic literature and on the gaps that we aim to fulfill. Although the large increase in the number of these PC initiatives 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

[1] As we will explain in the dedicated section, the NGO has limited resources, therefore by definition if it spends more in agriculture it must decrease expenses for the park. For the sake of simplicity, we assume with "size" every physical or monetary output derived from investments in the park (therefore not necessarily related to a geographical size). With "efficiency" we mean the degree of commitment to conservation by the local community.

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 (in part or completely), 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 of 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 reasons for these projects. The first is the frequent failure in conservation of top-down approaches calling for complete community physical exclusion from State owned protected areas. Second is the recognition that the cooperation of local population (both with project managers and within the community) is key for effective conservation since it decreases motivation for rule violation (Edmonds 2002, Ostrom 1990). Finally, these projects guarantee access rights (to different degrees according to the specific context) to natural resources for local communities whose livelihood depends on those resources. They thus demonstrate a difference, at least in the intentions, with the traditional approach of protected areas governance, shifting to a no-resource-use concept to a sustainable-use narrative that should

be compatible with both conservation and local development (Ostrom 1990, Baland and Platteau 1996, Agrawal 2007, Campbell and Vainio-Mattila 2003, Adams and Hutton 2007).

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 2012, 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".

We contribute to the participatory conservation literature in the following ways.

First, we translate into economic modelling what has been highlighted in field studies, in order to reply to the economic arguments according to which, as explained above, if stakeholders are provided with property rights over a resource, automatically the correct incentives emerge and they will behave in the desired way. ICDPs reality challenges this simple theoretical solution. By remaining into the field of economic modelling, we show how it is possible that this schema (transfer of property rights) still produces inefficient outcomes.

Second, we introduce directly the NGO perspective, by keeping into the same model the three dimensions: the needs and incentives of local community, of the NGO and of the donors. Moreover, we tackle interactions in two directions: between the NGO and the farmers and between the NGO and the donors. In this way we depict the NGO as an actor that has not a full freedom of decision on its relation with beneficiaries, while in turn it is subject to constraints, and it is trapped between two sources of pressure. Looking the dynamic from a "principal agent theory" perspective, we could say that the NGO is at the same time the principal (with respect to the farmer) and the agent (with respect to the donor). Third, we inform our work through, and hope to contribute to, different streams of literature: protected area governance, participatory narratives in conservation projects, integration of conservation and development, NGO behaviors.

Our work aims to fulfill a number of gaps in the related literature. In the field on participatory conservation many studies focus on intra-community dynamics (Platteau 2004, Platteau and Abraham 2002, Platteau and Gaspart 2003, Tarui 2007, Gardner et al. 2000, Alix-Garcia 2008, Platteau and Seki 2007) or between communities (Winkler 2011).

Other studies (Barrett and Arcese 1998, Johannesen and Skonhoft 2005, Schulz and Skonhoft 1996, Skonhoft and Solstad, 1998 and Skonhoft 1998), among others, concentrate on the competition in wildlife harvest between locals and a reserve management. We focus instead on the dynamics between the community and an actor like an NGO that involves the community in a program having wider scope than simply tourism management.

Some scholars problematize the PC scheme by focusing on the complexities and contradictions of practices that foster local participation into natural resource management, by critically analyzing the gaps between intentions and real power allocation for decisions (Bixler et al. 2015, Nuesiri 2017). However, they pose relatively less attention to the trade-off between livelihood and resource conservation in itself. Some other scholars (Schulz and Skonhoft 1996, Fischer et al. 2011) focus on the possible different scenarios regarding resource use versus resource preservation, by analyzing as well the dynamics of resource availability, but they lack considerations on the actual degree of community involvement in the decision making over those scenarios, although in ICDPs intentions local participation is always present. We aim to link the two discourses, by explaining which are the rational reasons from the point of view of the NGO to "grant" participation and by showing why this is not sufficient to create automatically the conditions for a behavioural change of the local farmers and to increase their commitment to conservation at the level desired by the project.

Moreover, a wide range of studies, across different disciplines, either argue that ICDP projects fail, by observing empirical results (Well et al. 2004, Garnett et al. 2007) or that are likely to fail, by considering inherent theoretical contradictions (Barrett and Arcese 1995, Wells and Brandon 1992, Ferraro 2001). However, to the best of our knowledge, no study

explores the reasons that impede a consequent quick attitude change by the project designers, as reaction to the persistence of failures or suboptimal outcomes.

Regarding studies on environmental NGOs, Brockington et al. (2018) analyze in depth the features of the conservation NGO sector: major players, strategies and narrative, so as relations of NGOs among them at an horizontal level. However, they do not address systematically vertical relations with the projects beneficiaries on the one hand, and, on the other hand, with donors. Distinct features of conservation NGOs, their proliferation and influence on national priorities in developing countries are documented through many case studies (among others Duffy 2006, Lees 2007, Larsen and Brockington 2018), although there is not a comprehensive discourse that connects these analyses to debates on protected area management and the trade-off between conservation and development at the same time.

2. Participatory conservation in Burkina Faso and Vietnam

An important conservation project (documented in Vallino 2009) conducted in Western Africa presents interesting dynamics. The GEPRENAF project involves a large forest (300,000 ha) and its inhabitants in the Comoé region, located in the south of Burkina Faso and the north of Ivory Coast. The project began in 1996 and ended in 2002. The total budget for the Burkinabè part has been very large, US $ 6.6 million (*ibid.*). The area involved is one of the richest of Burkina Faso from the natural point of view.

The surface devoted to agriculture is 9% of the total area under the project, but it increased dramatically from 1956 to 1998 (*ibid.*) due to immigration from other areas. The zone attracted farmers because of relatively high soil fertility, and because it represented a pacific

area for escaping from the conflict in Ivory Coast, just across the border. The main threats to the ecosystem are the excessive extraction of forest resources by the increasing population of the surrounding villages: hunting, agriculture and animal husbandry, and bush fires for crop rotation (GEPRENAF 1997).

The population of the beneficiary villages in the area use extensive agricultural techniques, therefore the cultivation of cash crops like cotton and yam reduces the land available for food crops, and impoverishes the soil significantly. Subsistence hunting is still largely practiced and is considered important in the local culture. Villages are highly dependent on natural resources: hunting, fishing and harvesting of forest products are additional sources of income, besides agriculture and grazing.

The GEPRENAF project, implemented in this remote isolated community, brought a large amount of financial resources and promoted the achievement of ambitious goals, although most of these goals were not properly understood by the indigenous rural population. To pursue these goals, the GEPRENAF project first conducted a consultation and negotiation with the local community concerning the old boundaries of the pre-existing forest estate and the change of status to partially protected area. Within the protected area, the local population is allowed to harvest dry wood, fruits, medicinal plants, honey, and fish, while hunting and agriculture are prohibited inside the conservation area (but are allowed in the buffer zone). The project also foresees the organization of tourism activities in the reserve. Secondly, the project supported the creation of the Inter-Village Association for the Management of Natural Resources and Wildlife (AGEREF), which became the concessionaire of the reserve. Thirdly, the project supported the construction of certain infrastructure in the villages (such as schools, health centers, water wells, and four buildings

for hosting tourists). Finally, the project staff implemented micro-projects for income generation for the local population.

The AGEREF is responsible for the management of the different project branches: (i) reserve management (for example, local community members were hired for maintenance and anti-poaching activities); (ii) support of micro-projects and income generating activities, such as agroforestry, bee-keeping, soap production, *karitè* butter production, and marketing of forest products. (iii) development of safari hunting and tourism in the park; (iv) redistribution of project benefits to the local community; and (v) representing local communities in national and international institutions.

The overall assessment of the economic impact of the GEPRENAF project on the population and the level of income generated by the management of the reserve shows a weak outcome. The project improved the living conditions of the beneficiary villages through the creation of infrastructures and empowered the local communities institutionally, but in return required the confiscation of agricultural land and the enforcement of strict limitations on hunting, grazing and fishing rights within the protected area. The project did not create concrete alternatives to extensive agriculture and grazing to fulfil subsistence needs of the local people. For these reasons the whole institutional scheme is still weak and needs to be continuously legitimated. Moreover, illegal hunting and crop cultivation continue to take place inside the reserve. The reliance on safari hunting as principal source of income is not sustainable.

A key aspect where community preferences are in clear contradiction with the project designers is the construction of infrastructure. Building infrastructure, especially schools, bridges, and water wells, would have a highly positive impact on the community. However,

the situation is still far from satisfying its needs. Some villages complain about lack of drinkable water. The maintenance of some infrastructure such as mills and health centers is problematic. The situation of the roads is crucial, since the project did not invest in the improvement of communication and transportation, which is essential for the achievement of the project's objectives. In a project assessment document, the World Bank affirmed that it is not possible to build a bridge over the river Comoè, which separates two clusters of villages, because it would disturb wildlife, hence going against the priorities of the project (Banque Mondiale 2000, p. 20). Such statements demonstrate that despite the emphasis given by the project to the coupling of socio-economic and environmental goals, in the moment of practical application, the actual authorities' priorities emerged, with a bias toward the achievement of conservation objectives.

Another case study that highlights key tensions between the project mission and the priorities of the local community is discussed by Larsen (2008).

The Phong Nha Kẻ Bàng area (PNKB) in Vietnam was established in the post-colonial time (Larsen 2008). Since the 1930s the national Forest Code aimed at controlling and eliminating shifting cultivation within the boundaries of the so called "intact forest" area. Phong Nha was declared a small reserve (5,000 ha) in 1986, and the area under protection was gradually extended during the 1990s and the 2000s up to almost 90,000 ha. In 2001 the site reached the status of National Park and in 2003 it was awarded the World Heritage Status. At the time of the Larsen's study (2008) the area under protection was in further expansion due to World Conservation Union recommendations and to the requests of an upcoming 15-million-dollar project supported by the German Financial Cooperation (KfW) and the

German Agency for Technical Development (GTZ). The park is separated into three zones: a strictly protected "core" zone (64,894 ha), an ecological recovery zone (17,449 ha) and a service/administrative unit (3,411 ha). In the latter living and working facilities are present, however the former two include the majority of local settlements.

Generally, in Vietnam protected area design is mostly a top-down process involving mainly central-level and provincial institutions, as well as scientific and conservation communities. In addition, in Vietnam conservation NGOs have been very active within the last decades, often playing crucial roles in the formulation of conservation strategies. General policy has traditionally had a strong "no–use" orientation. In the core protection zone, regulations forbid any forest use and human presence, although it has been estimated that up to 80% of Vietnam's protected areas are inhabited (Larsen 2008, p.444). The 2004 Law on Forest Protection and Development states that households can remain in the ecological restoration zone only under specific contracts for protection and development. In the PNKB area, agricultural land remains scarce. Local communities are traditionally highly forest-use dependent: forest use ranges from collecting firewood and non-timber products to hunting for subsistence and for national and international markets.

The PNKB protected area is officially under the responsibility of the Provincial People's Committee of Quảng Bìn. In official declarations, community participation is pursued through the "forest protection contract system", and with "awareness-raising" activities, which are considered as the main avenue to create social incentives for protected area compliance (*ibid*., p. 451). According to this system, forest land is assigned to households and payments are provided based on protection performance. Tourist activities are

organized in some areas of the National Park, involving directly a fraction of the local population in services provision and enforcement.

According to the study (*ibid*.), the impact of the creation of the Protected Area on livelihood has been extremely negative, especially for ethnic minorities. Communities living in the core zone had to reduce dramatically their agricultural practices and started to live on rice subsidies. The protection contract system itself has been limited in value and scope, focusing the benefits on a relatively small share of households of the area. Those households had to bear the costs of renouncing to exploit resources in the protected area, to perform extra work for direct conservation activities, to experience very limited benefits in return.
Along with the World Heritage designation in 2003 international and domestic tourism exploded, providing ground for positive narratives on employment creation linked to the park creation (*ibid*. p. 452). However, in reality, tourism in this area faced multiple problems. Its absorption capacity in terms of employment for tourism services and forest guards turned out to be low, generating income for only a small fraction of population. Regarding the tourism services offered (for example, the boat tours), supply soon started to exceed the actual demand. Spin-off activities remained at a small scale and concentrated in a single community. The limited employment opportunities did not create sufficient incentives for interrupting illegal exploitation of forest resources and illegal hunting. A considerable share of tourism revenue was channeled to the Provincial authorities and not to the local community. In general, basic livelihood activities remained extremely vulnerable, constrained by lack of tenure security and limited rights to practice subsistence activities, while some communities continue to be heavily dependent on rice subsidies.

Despite the persistence of high poverty rates in the PNKB area, and despite the development of the narrative on coupling participatory conservation with livelihood support, the higher-level funding institutions seem to remain concerned solely about conservation. Community involvement in park management and income-generating activities is encouraged mostly to enhance local consensus on conservation rather than to improve local living conditions, as noted also in many other similar initiatives worldwide (Campbell and Vainio-Mattila 2003):

> "There is a fairly distinct national-level conservation community comprised of the Forest Protection Department, governmental and semi-governmental scientific institutions, which mainly play a role at the policy, overall systems and planning levels. Various international conservation NGOs such as WWF, Fauna & Flora International (FFI) and German zoological societies have undertaken project activities in the area, yet have only in a very limited way touched directly upon livelihood activities. (…) Development and conservation activities tend to work in parallel without much interaction" (*ibid*. p. 458).

Infrastructure development such as road building (for example in the context of national development plans) has been questioned and criticized by the environmental NGO community. Funding from international conservation organizations derives from simplistic assumptions, according to which supporting to a low degree the local community and providing small economic returns from conservation would create sufficient incentives for ceasing natural resources exploitation and hunting. According to Larsen's analysis of the project documents (*ibid.*), the relatively new KfW project apparently focuses more on livelihood concerns, but in reality remains ambiguous about the actual priorities. On the

one hand, it promises forest land allocation, improvement of tenure security and increase of benefits in the buffer zones, while on the other hand, plans an expansion of the no-use core area and classifies agriculture and road development as threats. It uses the argument of enhancing income diversification for the "poor" to justify the prohibition of shifting cultivation (*ibid*. p. 461). It seems to still consider the community itself as a problem external to the park rather than an integral part of its management. Considering the general approaches of international and national actors in the conservation sector in Vietnam, Larsen (*ibid*.) argues that the reasons for limited room for adaptive management and overcoming of such limitations lie, on the one hand, on the fact that voices of the local community do not reach the public sphere, although they are often aware of the contradictions mentioned before. On the other hand, international donors are tied to the narrow mission of strictly reaching project objectives. Therefore, when the complexity of the interplay between conservation and local livelihood and development emerges, donors tend to prioritize the former over the latter (Campbell and Vainio-Mattila, 2003; Songorwa, 1999).

3. The model

3.1. Setup

Our model applies to situations in which an external actor implements an ICDP project in low-income rural communities, where households are dependent for subsistence objectives on natural resources that are supposed to be protected. 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.[2]

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.[3] 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, wood collection, and other activities that provide revenue to community members but that might harm conservation). We assume from the beginning that agriculture take

[2] 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.

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

place outside the protected zone and what we label as "hunting" inside; therefore the second activity is the most harmful for the natural area. Each farmer is endowed with one unit of time. The farmer allocates his time budget between agriculture and hunting, so as to diversify income risks (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 $0 < \alpha \leq 1$ 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 $1-p_h$ (the probability distributions of outcomes in hunting and agriculture are assumed to be independent), 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 carrying capacity of the environment in terms of wildlife resources (the expression for farmer *B* is analogous). Notice that the good year's income from hunting has the form of a contest success function (Tullock 1980, Perez-Castrillo and Verdier 1992), which we impose to capture idea that the income-generating activity that harms conservation is subject to competition between farmers.

3.2. 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 marginal cost of hunting for farmer A (MCt_h^A) is expressed thus in terms of opportunity costs with respect to his own agricultural activity ($1 - t_h^A$)

The left-hand side (farmer *A*'s marginal cost of hunting time) is expressed in terms of opportunity costs with respect to his own agricultural activity, and 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

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

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, moreover, at the equilibrium, the slopes of the two curves are zero.[4]

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 very high (a tiny quantity of hunting time would give farmer *A* the entire carrying capacity). As the rival

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

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) is growing (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 of cutting his hunting effort. The symmetry of the objective functions of the two farmers implies then that both farmers rationally expect the rival to 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:

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

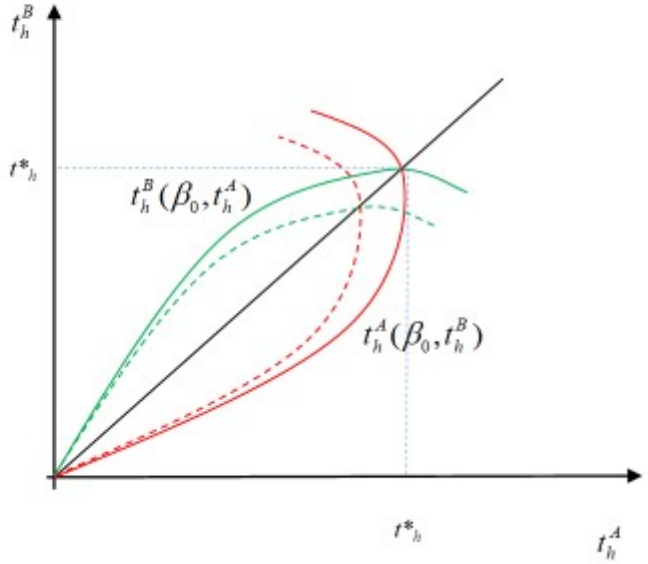
Applying the implicit function theorem to this expression, we obtain the following simple comparative statics result:

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 rather 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.

Figure 1. Nash equilibrium hunting without NGO



3.3. Community with NGO under complete contracts

An outside actor interested in conservation (the NGO) assumes that farmers A and B are not able to cooperate and solve the tragedy of the commons emerged from the Nash equilibrium played in the above analysis[5]. Therefore it may consider an external intervention as necessary in order 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 mission is to maximize conservation, and its project 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).

[5] Since the NGO represents a broader interest in terms of conservation, from its perspective every hunting level different from zero is considered overuse.

As a benchmark, suppose that complete contracts between the NGO and farmers are feasible. Denote with *z* 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

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

where γ is a parameter capturing the (irreversible) damage done to the environment by hunting.[6] Since *Q* and γ are constant, this problem is equivalent to

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

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 $t_h > 0$.

Regarding the values that *w* should have such that the farmers prefer to accept the payment scheme[7] , we observe that 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

[6] Given that we abstract from dynamic considerations, suppose that *Q* is at its steady-state value.

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

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

$$p_a\beta_0 + w^{high}. \quad (11)$$

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

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

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

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[7] 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.

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

3.4. 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. strongly reducing "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).

Substantial evidence supports both of these elements. Regarding the first, 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 2012). 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 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).

Further considerations arise for the long run. First, 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.

Second, 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).

Third, 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 2012). This might discourage local farmers from relying on tourism revenue as a reliable source of income. Sanjayan et al. (1997) argue that "…indeed the income needs and expectations are not fixed at a certain level, and increased income derived from ICDPs (…) is frequently accepted by people in addition to, rather than *in lieu* of income derived from access to protected areas" (McShane and Wells 2004, p. 18, from Sanjayan et al 1997).

Finally, as Barrett and Arcese (1995) identify, the lack of functioning of rural markets limits the effectiveness of monetary transfers from tourism. For cash transfers to be effective, local people must be able to exchange money for food or other consumption goods. However, in rural and remote areas, the opportunity of this exchange is often constrained by poor access to markets due to high transaction costs (Muller and Albers 2004, De Janvry et al. 1991).

In general the contradictions of the tourism revenue are shown in the two case studies presented above. In the Vietnamese Park tourism boomed because of the World Heritage status, while in the Burkinabé case touristic activities never raised at substantial level. Nevertheless, in the two examples livelihood problems related to the PC scheme were very

similar, and so were the difficulties for the local community to absorb effectively the revenue from touristic activities.

Consider now the second key element of our mechanism, i.e., that the productivity increases in agriculture would induce farmers to devote more effort to conservation. We recall that it is assumed that agriculture takes place outside the conservation area, and what we label as "hunting", inside. Therefore if agricultural productivity increases, on the one hand "hunting" decreases and therefore there is higher possibility to conserve better the park; on the other hand farmers have more time to devote to conservation activity directly, as it is desired by the project scheme. 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[8]. 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".

Thus, our analysis is complementary to the findings by Deininger and Minten (1999) concerning the relation between deforestation and agricultural intensification in Mexico. They discovered that existing forms of communal agricultural land are not associated to high deforestation rates, that there is apparently no incompatibility between agricultural support policies and conservation objectives in the medium to long term, and that poverty influences negatively the forest cover. Therefore, as they argue, "policies that focus on natural resource conservation without concern for the socioeconomic well-being of the affected population may be seriously misguided" (ibid.: 336).

[8] Angelsen and Kaimowitz 2001a offer an excellent and 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).

It is important to note that the positive effect of a support for agriculture does not lie only in the fact that agriculture would become more productive than hunting, but is more general: if agriculture becomes more productive and generates higher income, the profit derived from tourism could be always more a complement, rather than a substitute. With a higher overall income, farmers would bear better the costs of the efforts dedicated to the park.

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* the amount used for agricultural support (i.e. *F-e* are funds devoted to environmental conservation). The NGO expenses in agriculture will influence the net marginal benefit of hunting activity of the farmers, which, in turn, will influence 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 are 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: $(F-e)(Q-\gamma\sum t_h)$.

The agricultural productivity depends 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 rather small (or zero) 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 and Feder et al. 1985) or contain a non-divisibility.[9]

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

Let's assume that the two farmers split the revenue from tourism equally. The utility-maximization program 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.

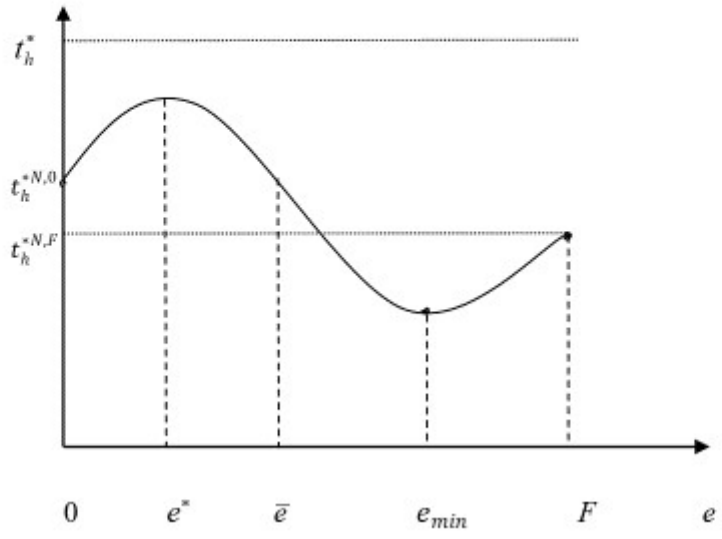
[9] The related literature shows that when a new technology in agricultural environment is introduced, at the initial stage it encounters significant barriers to adoption and impacts arise only after a given period, for diverse reasons: farmers have imperfect knowledge of the new technology; economies of scale derived from accumulation of experience with the new technology do not emerge immediately; farmers may be discouraged by the initial low economic impact of the agricultural innovation (Feder et al. 1985, Foster and Rosenzweig 1995). In any case, our main result (concerning the effect of donor financing) holds even for the everywhere concave function $\beta_1(e)$. The above assumptions on the shape of the functional form serve to show our result more starkly.

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

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

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 the whole amount of resources to conservation, the amount of hunting time that equates the marginal benefit of hunting to its marginal cost is high. As *e* increases, the marginal benefit of hunting (described by the right-hand side of (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).

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



Suppose that e keeps increasing. Beyond a certain level (corresponding to point e^* on Figure 2), the effect of agricultural extension on productivity takes off 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 $\overline{e}$, 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 $\overline{e}$ is counter-productive.[10]

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.

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).

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

[10] 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).

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): $p_a \beta_0 \alpha (1 - t_h^A)^{\alpha-1} + \frac{FR\gamma}{2} = p_h Q \frac{t_h^B}{(t_h^A + t_h^B)^2}$ (15')

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

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): $p_a \beta_0 \alpha (1 - t_h^A)^{\alpha-1} + p_a \beta_1 (F) \alpha (1 - t_h^A)^{\alpha-1} = p_h Q \frac{t_h^B}{(t_h^A + t_h^B)^2}$. (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 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.

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.

Given these considerations, one may wonder why 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.

3.5. Donor discouragement and NGO's dilemma

The conservation-oriented NGO is typically strictly tied to its mission, and its donors' might strictly link 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 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).[11] Both the NGOs and governmental organizations which were 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,

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

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" (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 just too 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.

We solve the game by 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 $\underline{u} \le u(e)G_i$ 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

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

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

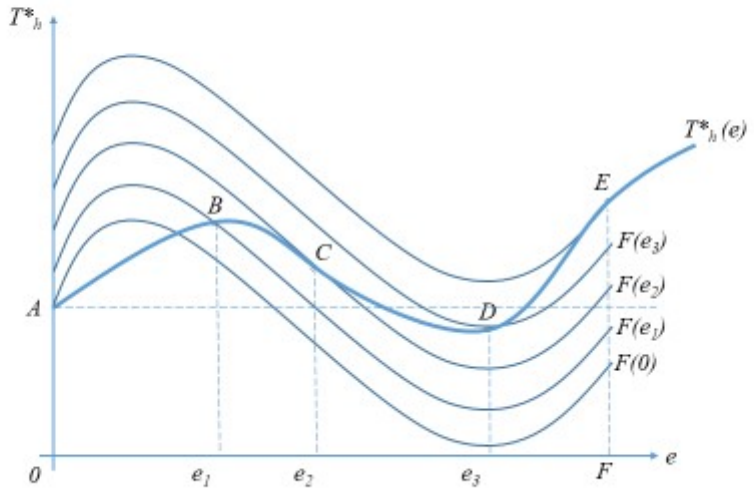
$$\frac{\partial F}{\partial e} = \frac{\underline{u}}{\left[u(e)\right]^2} u'(e) < 0. \tag{17}$$

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).

Figure 3. Endogenous NGO funds and total hunting



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 ($e>o$). 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 ($e=o$). The conservation area is the maximum that the NGO can create, but the total hunting is relatively poorly restrained.

4.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 2012).

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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