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Payments for Ecosystem Services in Nicaragua: Do Market-based Approaches Work?

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ABSTRACT

The concept of Payments for Ecosystem Services (PES) is gaining increasing attention among scholars as well as conservation and development practitioners. The premises of this innovative conservation approach are appealing: private land users, usually poorly motivated to protect nature on their land, will do so if they receive payments from environmental service buyers which cover part of the land users' opportunity costs of developing the land. However, this article warns against an over-enthusiastic adoption of a one-sided market-based PES approach. Based on a field study of the Regional Integrated Silvopastoral Approaches to Ecosystem Management Project (RISEMP), one of the main PES pilot projects in Nicaragua, it suggests that a mixture of economic and non-economic factors motivated farmers to adopt the envisaged silvopastoral practices and that the actual role of PES is mistakenly understood as a simple matter of financial incentives. The authors argue that PES approaches should be understood as a part of a broader process of local institutional transformation rather than as a market-based alternative for allegedly ineffective government and/or community governance.

INTRODUCTION

Agricultural activities are considered to be one of the main causes of tropical deforestation and biodiversity loss (Kaimowitz and Angelsen, 1998). In Central America, the advance of the agricultural frontier, caused by expanding cropping areas and pastures, is deemed to be the root cause of these problems (ibid.). Although there is no consensus on the driving forces (Angelsen and Kaimowitz, 1999; Geist and Lambin, 2002), several policy scenarios have been tried in order to change land use of farmers, most of them without much

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impact (Ferraro and Simpson, 2002; Pearce, 2004). Apparently, farmers are not motivated to adopt alternative forms of land use. In some cases, this is attributed to a lack of know-how and technical assistance; more often the main reason is taken to be the absence of economic incentives (Ferraro and Simpson, 2002).

At the same time an increasing body of research is focusing attention on the role of ecosystems as ecosystem service (ES) providers (MEA, 2005). This new approach defends the intrinsic value of ecosystems, but also stresses the economic benefits that they provide to society (Costanza et al., 1997; MEA, 2005). Consequently, it is a small step to argue for the integration of ecosystems in the global market, attributing monetary value to their services (Costanza et al., 1997). In this way, the ecosystem has chance to 'earn its own right to survive in a world market economy' (McAfee, 1999: 134).

In this context, the concept of Payments for Ecosystem Services[1] (PES) has gained increasing attention both from scholars and from conservation and development practitioners. This innovative conservation approach is built on the premise that in normal circumstances — that is, in the absence of direct incentives — land users are poorly motivated to protect the environment on their land. However, this changes if they receive payments from ES buyers which at least cover the land users' opportunity costs of more environmentally-sound land use, thus 'tipping the balance' in favour of ES provisioning (Engel et al., 2008; Pagiola et al., 2002; Wunder, 2005). While the concept seems attractive at first sight, it suffers from several shortcomings in both its theoretical underpinnings and its practical implications. This article aims to highlight these shortcomings, and to issue a warning against over-enthusiastic adoption of the PES approach.

Our research is based on a field study of the Nicaraguan component of the Regional Integrated Silvopastoral Ecosystem Management Project (RISEMP), implemented from 2002 to 2008 in three Latin American countries (Nicaragua, Costa Rica and Colombia), under the auspices of the Global Environment Facility (GEF) and the World Bank (Vaessen and Van Hecken, 2009; World Bank, 2002). After this introduction, the article first takes a closer look at the definition and theoretical underpinnings of PES. It then describes the RISEMP project in Nicaragua and analyses its results, focusing on the motivations for the observed land use changes. A final section elaborates a complementary theoretical reflection on motivational crowding-in or crowding-out in a PES-system.

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1. Often also referred to as Payments for Environmental Services. In this article we use the terms interchangeably. For overviews of PES terminologies, see Ravnborg et al. (2007); Wunder (2005).

THE PES CONCEPT AND ITS THEORETICAL FOUNDATION

Underlying Philosophy: Externalities and Missing Markets

The underlying logic for the creation of markets for ecosystem services in agricultural landscapes goes something like this: ecosystems such as natural or secondary forests, but also human-engineered landscapes like cultivated agricultural parcels, provide mankind with marketed goods and additional 'services' such as carbon sequestration and storage, biodiversity protection, watershed protection and scenic beauty, which are provided at local, regional and global levels (Landell-Mills and Porras, 2002; MEA, 2005; Wunder, 2005). Since these ES are mostly public or club goods, and thus externalities for which markets do not exist and for which beneficiaries seldom pay, society is under-provided with these services (Pagiola et al., 2002). Since the *de facto* ecosystem managers (farmers, loggers, etc.) receive relatively few private benefits from land uses such as forest conservation or ES-enhancing investments, those socially more optimal land uses can usually not compete with other land uses, such as croplands or pastures, which are more attractive from the land users' point of view (Engel et al., 2008; Pagiola et al., 2002). Such market failure is believed to be one of the main causes of environmental degradation (Pearce and Turner, 1990).

According to the PES philosophy, policy instruments such as governmental regulatory frameworks (command-and-control measures), or more community-based voluntary and educational approaches, have often proven to be ineffective in halting degradation (Engel et al., 2008; Wunder, 2005). The preferred solution, therefore, is to generate a monetary remuneration for positive environmental externalities, by making them tradable in markets or quasi-markets.[2] In this way, service providers are able to trade the positive externalities which they provide by managing their land 'adequately'. The PES mechanism thus establishes a compromise between social conservation and private land user benefits (Pagiola et al., 2005) by shifting control of natural resources from states or communities to markets (McAfee and Shapiro, 2008).

Trying to integrate nature's value into the wider economy, the key ideas of PES can be traced back to neoclassical environmental economics (Pearce and Turner, 1990; Perman et al., 1999). This ascribes the causes of environmental degradation to the chronic failure of markets to internalize environmental externalities, and to the public or club good characteristics of ecosystem services which engender free-riding behaviour. Nevertheless, the PES concept moves beyond the Pigouvian philosophy of taxing negative or subsidizing positive externalities within existing markets, by focusing on the provision

2. We use the term 'quasi-market' for a situation in which the demand-side of the market is substituted by a public (state, local government) or semi-public actor (development agency, NGO).

of certain (positive) services which are traded in newly-created markets. The PES approach defines the problem not so much as a 'simple' pollution problem, but rather as a social cost problem (Salzman, 2005). It attempts 'to put in practice the Coase theorem, which stipulates that the problems of external effects can, under certain conditions, be overcome through private negotiation between affected parties' (Coase, 1960, cited by Engel et al., 2008: 665).

The PES approach thus recognizes externalities but, in contrast to the Pigouvian philosophy, detaches the *positive* externalities from their marketable commodity and creates a parallel market or quasi-market for them, which should lead to the lowest-cost conservation and consequently the highest social welfare. Ideally, a market in which the demand of the (more or less numerous) ES buyers and the supply of (usually many scattered) ES providers meet, determines the price of the ES. In practice, however, international and national public actors (donors and governments) and/or local governance bodies (municipalities, community organizations) need to organize payments and determine price, substituting the unexpressed and difficult to organize demand-side of the ES market. Yet, even though government or communities may finance PES, it still remains a market-based model to be distinguished from government 'command-and-control' or community-based governance, as the supply response is based upon individual decision making mediated by price incentives. Given the incipient and experimental nature of PES systems, some authors also argue that the demand side of the market might be developed in the future (Wunder et al., 2008: 851).

Definition of PES

To distinguish the PES concept from other market-based conservation instruments, Wunder (2005: 3) provides a definition of PES as 'a voluntary transaction where a well-defined ES (or a land-use likely to secure that service) is being "bought" by a (minimum one) ES buyer from a (minimum one) ES provider if and only if the ES provider secures ES provision (conditionality)'. This definition presupposes some basic requirements which have to be fulfilled in order to belong to the PES family. First, the voluntary transaction assumes that ES providers have a relevant range of *real* land use choices, and can choose to respond or not to the monetary incentives provided by the purchase of the ES. This characteristic distinguishes the approach from command-and-control approaches that restrict these choices by force or consensus (Ravnborg et al., 2007; Wunder, 2005). Given the difficulty, already mentioned, of organizing the market on the demand side, it is often necessary for the state (usually with the support of international donors) or some local community or other governance body to play the role of the minimally required one buyer and to act as the representative expression of demand

from the public.[3] From the demand side, the voluntariness criterion is thus hard to comply with in practice.

Secondly, the commodity itself — or at least the land use proxy which will *likely* result in the provision of the ES — should be well defined (which implies measurability of the ES). Wunder recognizes that this part of the definition can be problematic, especially because the lack of scientific knowledge on the relationships between a proxy and its real ES-providing effect can undermine the sustainability of the transaction. Thirdly, a PES scheme requires that resources go from buyers to providers. It is here that the PES approach is particularly innovative; it ties the direct payments immediately to the investment goals instead of focusing on indirect conservation actions (Ferraro and Simpson, 2002). Finally, the hardest requirement to meet, according to Wunder, is the conditionality criterion, which in practice implies the establishment of a baseline and monitoring of compliance by the buyers or intermediaries, which might generate prohibitive transaction costs. Although the definition sketches the PES approach as a rather simple and straightforward mechanism, a closer look at every criterion of the 'pure' approach leads even Wunder to the conclusion that there have been few 'true PES' schemes satisfying all criteria (Wunder, 2005).

PES Research and Experiences

In the first decade of this century, the documentation on PES experiences grew exponentially (Landell-Mills and Porras, 2002; Ravnborg et al., 2007). A large part of the literature is written from a neoclassical economic perspective by market instrument proponents who often take the creation of markets as desirable *tout court* (Landell-Mills and Porras, 2002; Salzman, 2005). Although Engel et al. (2008) admit that PES is not a one-size-fits-all solution to every environmental problem, the establishment of market-like payment systems to *ex ante* uncoordinated and 'free' ES providers are increasingly considered to be best or second-best solutions to environmental externality problems.

According to Jordan et al. (2003), McAfee and Shapiro (2008) and McCarthy and Prudham (2004), this pro-market promotion is associated with the rise of neoliberal discourse within supranational environmental policy-making institutions, which is matched by the rhetorical marketing claims of some PES adherents that unattractive regulated nature conservation should be converted into alluring private business transactions[4] (Salzman, 2005;

3. This actually creates conceptual confusion given the tension between the market rhetoric of PES and its usually government-financed and controlled implementation.
4. We do want to recognize, however, that beyond the marketing rhetoric many PES scholars do not necessarily claim that the creation of (quasi-)markets in ES is the sole solution to externality problems in all circumstances, let alone to the broader set of environmental

Wunder and Vargas, 2005). The World Bank has been a driving force behind this global discourse (McAfee, 1999). It has promoted various PES programmes, in particular in Latin America, including the RISEMP which is the subject of our research.

PES IN PRACTICE: THE RISEMP IN MATIGUÁS-RÍO BLANCO

The RISEMP started in 2002 and terminated in 2008. The project, a full-sized GEF/World Bank initiative, was a pilot experiment aimed at promoting silvopastoral practices[5] in degraded pasture areas through PES and technical assistance (TA). The targeted ES were biodiversity conservation and carbon sequestration. The project took place in Nicaragua, Costa Rica and Colombia. It had a budget of US$ 8.7 million, about half of this financed by a GEF grant (Vaessen and Van Hecken, 2009; World Bank, 2002).

Despite their long-term on-site private benefits, silvopastoral practices tend to be unattractive to farmers (Pagiola et al., 2007). The main barriers to the adoption of more environmentally-friendly silvopastoral practices are the requirement of substantial investment in capital and labour, and the long time lag between investment and higher productivity (Dagang and Nair, 2003). The main objectives of the RISEMP were demonstrating and measuring (1) the effects of the introduction of PES on farmers' adoption of integrated silvopastoral farming systems in degraded pasture lands; and (2) the resulting improvements in ecosystems functioning, global environmental benefits, and local socio-economic gains resulting from the provision of said services (World Bank, 2002). Both issues were to a large extent unexplored territories of inquiry and illustrate the innovative nature of the project (Vaessen and Van Hecken, 2009). However, it was not only the objects of research that were innovative; the research methodology, which at least in theory was based on a randomized experimental design with various participant groups receiving different incentives (payments and/or TA) or no intervention (control group), was unique. As such, through the use of scientific methods it was hoped to create a precedent which would serve to promote further replication of the PES approach.

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challenges. At the same time, they do claim that the market very often is the best solution to externality problems and usually present the analysis in terms of classical market or state (or sometimes community) governance choices.

5. Dagang and Nair (2003: 149) define silvopastoral systems as 'systems [that] integrate trees into livestock systems for multiple purposes including soil amelioration, shade, fodder, fruit, wood, and habitat for fauna'. According to Pagiola et al. (2008: 304) silvopastoral practices include '(1) planting high densities of trees and shrubs in pastures, thus providing shade and diet supplements while protecting the soil from packing and erosion; (2) cut and carry systems, in which livestock is fed with the foliage of specifically planted trees and shrubs ("fodder banks") in areas previously used for other agricultural practices; and (3) using fast-growing trees and shrubs for fencing and wind screens'.

In Nicaragua the project was executed by the research and development institute Nitlapán of the Universidad Centroamericana and the Costa Rican-based research centre CATIE. It took place in two micro-watersheds (Bulbul and Paiwas) in the central region of Matiguás-Río Blanco, 140 km northeast of the capital Managua. The region is characterized by a high degree of poverty (Levard et al., 2001), reflected in a low average per capita income of about US$ 340 (Pagiola et al., 2007), a low education level and limited access to basic services such as water and electricity. The site belongs to the so-called 'old agricultural frontier' region; it is situated in the buffer zone of the Cerro Musún nature reserve, and close to the Quirragua nature reserve. Typically in these areas entitlement to land is related to the (albeit now imaginary) act of colonization: that is, the conquering of the 'savage and unproductive' forest land in order to make it suitable for agricultural and cattle production. In this context, local perceptions view the clearing of forest through hard labour as introducing *mejoras* (improvements) for which producers need to be compensated when their land is sold or expropriated, even when it belongs to a protected area (Bastiaensen et al., 2006: 15–16). At the same time, the 'agricultural frontier' label gives the region the character of an 'institutional barrier quite far from established country infrastructure. . . in which there is little state presence' (Baumeister and Fernandez, 2005: 80). Furthermore, its recent past reveals a history of active (and even armed) peasant resistance to state intrusion, indicating that there is little chance of effective government command-and-control in this region.

Until the beginning of the twentieth century, the area consisted predominantly of forests. Increasing colonization, mainly by peasants in search of pasture land for their cattle, resulted in rapid deforestation from the 1920s onwards (Maldidier and Marchetti, 1996). In 2003, only 20 per cent of the land that participated in the project was covered with forest, and more than 60 per cent was used as pasture for extensive grazing practices, with about half of this degraded pasture. With the gradual reduction of available land, however, the opportunity cost of colonization has increased significantly in the old agricultural frontier; besides spurring further migration towards the new frontier, this also gave rise to an incipient process of cattle and agricultural intensification. As a consequence, the silvopastoral practices promoted by the PES payments were already gaining ground before the implementation of the RISEMP project: in 2003, pastures with high tree density covered 17 per cent of the area and fodder banks almost 3 per cent (Pagiola et al., 2007).

Project Participants

Originally, the main hypothesis of the research — that the adoption of silvopastoral practices can be attributed to PES, to TA or to a combination of both — was to be investigated by subdividing 123 households, mainly

*Table 1. Project Participants by Treatment Group, 2002 (mean and standard deviation)**

Treatment Group	Group Size	Area (ha)	Household Size	Number of Cattle
		29.5	6.0	34.0
PES only	**28**	(25.1)	(2.7)	(35.5)
		31.9	6.3	34.8
PES+TA	**70**	(25.8)	(2.5)	(30.9)
		46.7	5.3	53.6
Control	**25**	(37.1)	(1.9)	(39.2)
		34.4	6.0	38.5
Total	**123**	(28.8)	(2.5)	(34.4)

Note:
*Data refer to households that participated during whole project duration (n = 123). Standard deviations indicated between parentheses.
Source: Vaessen and Van Hecken (2009).

small to medium-sized farmers, into three groups which would be treated differently (see Table 1). The largest group (ninety-eight households, almost 80 per cent) belonged to the PES group, which was further divided into two subgroups, depending on whether they received only payments (PES only) or payments and TA (PES+TA).[6] In order to distinguish the effects of the treatments, these groups were to be compared to a counterfactual, which was established by assigning twenty-five farmers to a control group. During implementation, however, the use of a control group turned out to be practically impossible, given that it was politically and ethically unacceptable to exclude certain poor and medium-sized farmers from project benefits in order to serve as the 'control group' (Vaessen and Van Hecken, 2009). As shown in Table 1, the control group members therefore differed significantly from the treatment groups.

Table 1 shows that the average participating household was composed of six members, and possessed about 34 ha of land and almost thirty-nine head of cattle. However, the high standard deviations for both area (28.8) and number of cattle (34.4) indicate large differences among households, which become clear when participants are subdivided into three main types of farmers.[7] The poorest group of households, the so-called *campesinos pobres con tierra* (CPT; poor peasants with land) possessed a small amount of land (maximum 20 ha), and generally lacked capital to invest in self-sustaining agricultural production. They had small herds of between two and ten animals. The richest group, the *finqueros ganaderos* (FG; cattle farmers), possessed vast amounts of land, sometimes up to 150 or 250 ha,

6. TA consisted of monthly workshops, personal farm visits by project staff and interchange of experiences (farmer-to-farmer knowledge extension).
7. The categorization into different types of farmers is based on Maldidier and Marchetti (1996) and Levard et al. (2001), updated by our own field observations.

and had large herds with up to 200 or 300 head of cattle. The intermediate group of *campesinos ganaderos* (CG; cattle peasants) typically possessed between 20 and 50 ha of land on which they kept around 20 to 100 animals. The latter two groups of households dedicated themselves almost exclusively to the breeding of dual purpose cattle, with only a small part of their land used for cultivation of basic staples for own consumption. The poorest group cultivated larger amounts of staple crops, but often also depended on hiring out family labour to the other two groups of farmers or on migration.

Monitoring and Payments for Ecosystem Services

Because the measurement and verification of the provision of ES is laborious and would imply huge transaction costs, the project worked with land use proxies (Pagiola et al., 2004). An 'environmental service index' (ESI) was elaborated, based on the aggregation of the estimated per hectare contribution of twenty-eight different land uses to biodiversity protection and carbon sequestration. Farmers' payments were calculated on the basis of the net *increase* of this ESI — which ranged from value 0 (land use least effective in providing the ES) to 2 (land use most effective in providing the ES)[8] — as compared to the baseline land use data for their farm in 2003.

Payments were made *ex post*, annually after the observed land use changes. The amount of payment per ESI point was calculated on the basis of the opportunity costs of more attractive land uses (Pagiola et al., 2007). The payments as such did not necessarily cover the full opportunity cost of the provisioning of the ES, but 'could "tip the balance" of profitability between current and costlier silvopastoral practices, by increasing the net value of investments in silvopastoral practices' (ibid.: 378). Based on calculations of the relative profitability of more attractive common practices, the payments were established at an annual US$ 75 per incremental ESI point. In order to eliminate perverse incentives (for example, the risk of farmers cutting down existing trees so as to raise the potential additional payments during project implementation) the baseline ESI points in 2003 were remunerated with a one-time initial payment of US$ 10 per point (Pagiola et al., 2005).

Research Methodology

In our research to investigate the motivations for farmers to change (or not to change) land use, we relied on different sources of primary and secondary data. First, we analysed the main surveys conducted during the project period by the CATIE, Nitlapán and World Bank staff. These surveys resulted

8. For a detailed explanation and overview of this ESI composition, see Pagiola et al. (2004).

in two main datasets: a baseline dataset (2002) and corresponding yearly socio-economic follow-up datasets, with detailed information on household characteristics and economic activities over the whole project period; and a land use dataset, with an overview of the land use changes per farm (based on remote sensing imagery) and the corresponding ESI scores and payments during the whole project period. Secondly, we analysed different internal and published documentation on the project. Thirdly, we conducted an extensive field study after project termination. This field study consisted of in-depth responsive interviews (Rubin and Rubin, 2005) with thirty-five former participating farmers in April 2008; and in-depth interviews with the Nitlapán project staff in July 2008. The farmers were selected on the basis of maximum-variability sampling (Glaser and Strauss, 1967; Van Hecken and Bastiaensen, 2009), in which all farmers were ranked on the basis of high, low and median values for certain variables in the above-mentioned datasets, such as participant group (PES, PES + TA, Control), received payments, farm size, location and accessibility, gender, herd size, and type of land use changes. The interviews with farmers were conducted in the absence of former project staff and in the name of the University of Antwerp in order to avoid being associated with the project and therefore eliciting socially desired responses. The interviews with the Nitlapán staff were conducted to cross-check some of the main findings of the farmer interviews: by bringing up some experiences or anecdotes from the farmers' interviews, we tried to form a more nuanced context for some of the narratives provided by the farmers.

ASSESSMENT OF THE RISEMP RESULTS

This section deals with the main results of the RISEMP, focusing on the land use changes and the motivation for these changes.

Land Use Changes

Table 2 reflects the observed changes in land use between 2003 and 2007. While the total area of pasture has remained stable, its composition has changed significantly. Degraded pastures decreased from 30.9 per cent to 10.1 per cent in five years. They were replaced by improved pastures with trees (up from 9 per cent to 23.8 per cent) and fodder banks (which more than tripled in area). By 2007, annual crops took up less than half the area they had occupied in 2003, while the quantity of living fences had almost quadrupled. Forests and scrub habitats remained stable, covering about 25 per cent of the total area. The most significant changes occurred during the first two project years. The novelty of the project and the system of payments, which each year repeatedly remunerated the incremental ESI points as compared

Table 2. Land Use RISEMP Participating Households (n = 123), 2003–2007

Year / Land Use	2003		2004		2005		2006		2007		Δ 2003–2007	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Crops (annual, grains, tubers)	310	7.4	207	4.9	146	3.5	130	3.1	123	2.9	−187	−4.4
Degraded pasture	1306	30.9	693	16.4	537	12.7	468	11.1	425	10.1	−881	−20.8
Natural pasture without trees	53	1.3	129	3.1	129	3.1	94	2.2	74	1.8	20	0.5
Improved pasture without trees	36	0.8	56	1.3	63	1.5	47	1.1	42	1.0	7	0.2
Semi-permanent crops	44	1.1	32	0.8	29	0.7	35	0.8	25	0.6	−19	−0.5
Natural pasture with trees	912	21.6	1179	27.9	1067	25.3	1088	25.9	1081	25.7	169	4.1
Improved pasture with trees	382	9.0	656	15.5	873	20.7	933	22.2	1002	23.8	621	14.8
Fruit crops	21	0.5	23	0.5	25	0.6	26	0.6	25	0.6	4	0.1
Fodder banks	104	2.5	178	4.2	227	5.4	288	6.9	324	7.7	220	5.2
Commercial tree plantations	1	0.0	3	0.1	5	0.1	12	0.3	5	0.1	4	0.1
Shaded coffee	2	0.1	3	0.1	20	0.5	9	0.2	6	0.1	4	0.1
Scrub habitats (*tacotales*)	221	5.2	211	5.0	234	5.5	216	5.1	207	4.9	−14	−0.3
Riparian forest	540	12.8	560	13.3	554	13.1	551	13.1	551	13.1	11	0.3
Intensive silvopastoral	4	0.1	1	0.0	6	0.2	9	0.2	11	0.3	7	0.2
Secondary forest (intervened)	184	4.4	195	4.6	184	4.4	189	4.5	183	4.3	−2	0.0
Secondary forest	43	1.0	45	1.1	63	1.5	61	1.5	65	1.5	22	0.5
Primary forest	41	1.0	37	0.9	40	0.9	33	0.8	37	0.9	−3	−0.1
Infrastructure, housing, roads	15	0.4	13	0.3	18	0.4	14	0.3	19	0.5	4	0.1
Total area	**4221**	**100**	**4221**	**100**	**4221**	**100**	**4203**	**100**	**4206**	**100**	**n.a.**	**n.a.**
Living fences*	127*	n.a.	284*	n.a.	448*	n.a.	448*	n.a.	479*	n.a.	352*	n.a.
Total forests	808	19.1	837	19.8	841	19.9	834	19.9	836	19.9	28	0.7
Total pasture	2693	63.8	2713	64.3	2676	63.4	2639	62.8	2636	62.7	−58	−1.1

Note:
*Expressed in kilometres instead of hectares.
Source: Authors' own elaboration based on project data.

Table 3. Changes in Land Use, Per Treatment Group (*), 2003–2007

Land Use / Group	Crop	TP	DP	NP-T	IP-T	NP+T	IP+T	FB	Tac	TF	LF**
PES+TA	−6.0	−0.4	−19.4	0.0	0.3	4.2	14.1	5.5	0.5	0.8	213.5
PES	−5.8	0.8	−21.7	−0.9	−0.1	2.0	21.5	4.9	−2.3	2.2	164.4
Control	−0.4	−4.0	−23.0	2.3	0.1	5.5	11.3	4.9	−0.4	−0.5	1364.4

Notes:
*Changes in land use: the additional percentage of the selected land use within the total land size of every treatment group.
**The per cent for LF is calculated as an increase in the length, compared to each group's initial LF length in 2003.
Legend:
Crop = annual crops; TP = total pastures; DP = degraded pastures; NP-T = natural pastures without trees; IP-T = improved pastures without trees; NP+T = natural pastures with trees; IP+T = improved pastures with trees; FB = fodder banks; Tac = tacotales (scrub habitats); TF = total forests; LF = living fences.
Source: Authors' own elaboration based on project data.

to the 2003 baseline, stimulated farmers to change their land use as early as possible since this implied higher total payments.

Project Incentives

Table 3 gives an overview of land use changes across the treatment groups. It indicates that degraded pastures have decreased in all groups, with the highest reduction paradoxically in the control group (−23 per cent). Also, living fences have increased most in the control group (eight times more than in the PES group). Fodder banks show a very similar pattern across the groups, while the highest increase in natural pastures, with and without trees, was also in the control group. The establishment of improved pastures with trees, however, has been highest in the treatment groups (14.1 and 21.5 per cent for the PES+TA and PES groups respectively, with an increase of 'only' 11.3 per cent in the control group). The control group is also the only group in which forest area decreased (−0.5 per cent). The amount of scrub habitats (*tacotales*) slightly increased in the PES+AT group (0.5 per cent), while it slightly decreased in the control and the PES group.

Although these data confirm that farmers have recognized the benefits of at least some silvopastoral practices and have increasingly adopted these practices, the comparison of land use changes among treatment groups does not provide firm evidence for the RISEMP hypothesis (Pagiola et al., 2005; World Bank, 2002) that observed changes are exclusively attributable to the payment incentive. Pagiola et al. (2007) argue that the similar results of treatment and non-treatment groups are attributable to the poorly chosen control group, with relatively more capitalized farmers from the FG and CG group. Thus, they conclude that the data on the control group are not useful, and choose to exclude them in their analysis. We recognize this problem with the control group, but do not think it justifies ignoring the information

on this group altogether. The control group data — no matter how biased — indeed indicate that there were other incentives triggering farmers' adoption of silvopastoral practices. An alternative distinction among participants and control group on the basis of types of farms helps to shed more light on the reasons why certain groups have (not) adopted certain practices, and how this emanates from different opportunity costs and livelihood strategies among types of farmers.

Motivations and Incentives to Adopt Silvopastoral Practices

Costs for establishing silvopastoral practices are relatively high. In the study region, they range from US$ 170/ha for sowing improved pasture on degraded pastures to US$ 390/ha for converting degraded into improved pasture with high tree density. Establishment of fodder banks ranges from US$ 170 to US$ 270/ha (Pagiola et al., 2008). Their on-farm benefits are mainly linked to increased carrying capacity and thus higher milk and meat productivity. The fact that all farmers, with or without PES payments, have invested heavily in silvopastoral practices bears witness to their intrinsic profitability. This represents a reversal of the traditional extensive production logic in the region, where CPTs maintain low cattle numbers because they lack capital, and CGs and FGs focus on the maximization of the return on their scarce input factor 'labour', translating this into very extensive cattle breeding and a constant drive to purchase more land (Maldidier and Marchetti, 1996).

Since payments were made *ex post*, land use changes had to be pre-financed by the farmers, some of whom turned to local microfinance institutions. Since the capacity to access higher project payments hinged on the farmers' ability to pre-finance the investments, this created a tendency towards the exclusion of the poorer CPT farmers, who had more difficulties self-financing or securing loans. This unintended 'bias' against poorer farmers is not only socially undesirable, but also raises doubts about the environmental effectiveness of the project. Nor does it help to slow the advancement of the new agricultural frontier, which is at least partially the consequence of migrating poor farmers selling their land in regions like Matiguás-Río Blanco to richer farmers, who can exploit it more effectively, in order to buy cheaper, unexploited land further down the frontier.

Differing Constraints among Different Types of Farmer Households

Differences in capital constraints and broader factor opportunity costs go a long way towards explaining the observed difference in investment strategy between the different producer types, largely independent from the PES payments. Table 4 re-examines the main land use changes, this time according

Table 4. Changes in Land Use, Per Type of Household (*), 2003–2007

Land Use / Group	Crop	TP	DP	NP-T	IP-T	NP+T	IP+T	FB	Tac	TF	LF**
CPT (n = 32)	−6.8	−3.5	−24.8	0.4	−0.4	8.8	11.4	4.6	2.8	1.2	167.6
CG (n = 67)	−3.6	−1.2	−16.6	−0.7	−0.5	−1.4	18.1	5.6	−1.2	1.1	263.0
FG (n = 23)	−4.7	−0.4	−24.8	1.9	1.0	9.2	12.0	5.0	−0.1	0.1	382.5

Notes:
*Changes in land use: the additional percentage of the selected land use within the total land size of every household type.
**The per cent for LF is calculated as an increase in the length, compared to each group's initial LF length in 2003.
Legend:
CPT = campesino pobre con tierra (poor peasant with land); CG = campesino ganadero (cattle peasant); FG = finquero ganadero (cattle farmer); Crop = annual crops; TP = total pastures; DP = degraded pastures; NP-T = natural pastures without trees; IP-T = improved pastures without trees; NP+T = natural pastures with trees; IP+T = improved pastures with trees; FB = fodder banks; Tac = tacotales (scrub habitats); TF = total forests; LF = living fences.
Source: Authors' own elaboration based on project data.

to the type of household. All farmers have invested in improved pastures and fodder banks, mainly by transforming degraded pastures to these more productive uses. Living fences have also been very popular among all groups. The relative changes in productive uses (mainly improved pastures and fodder banks) have been highest in the more capitalized groups (FG and CG), with the CG group accounting for the most significant intensification (+5.6 per cent in fodder banks and +18.1 per cent in improved pastures with trees), and the lowest decrease in degraded pasture (−16.6 per cent). Increases in areas of *tacotales* have only taken place in the case of the poorest CPT group.

At first sight it seems remarkable how closely the land use changes of the FG group resemble those of the much poorer CPT group, with a similar decrease in the amount of degraded pastures and annual food crops, and increase in fodder banks and in natural and improved pastures with trees in both cases. FGs and CPTs have invested relatively less than CGs in fodder banks and improved pastures, and have relied more on the use of natural pastures. The similar manifestations of land use changes have, however, different origins. The lower adoption rates of the more productive and intensive land uses (mainly improved pastures and fodder banks) among the CPT group reflect the limitations they often experience due to labour, space and capital constraints. During our interviews, for example, we found that many smaller farmers had tried to invest in fodder banks, but because of the long time lag before the fodder banks could be exploited and the limited alternative pasture available to bridge this time lag, they were often forced to let their cattle enter the newly established fodder banks, which led to their destruction. The same limitations also explain the relatively large increases in natural pastures, which do not require high capital and labour inputs, and thus save precious labour time for crop production or off-farm employment.

In the case of the FGs the reliance on natural pastures and lower increases in improved pastures and fodder banks can be explained by the relative land abundance of these farmers, which makes labour the scarce input factor, and stimulates the extensive use of land, with minimal investments in land intensification. However, this land extension strategy has been changing during the last few decades (more on this below), which explains the increases (smaller than among the CGs, but nevertheless positive) in the adoption of more intensive practices.

The increase in areas of *tacotales* in the CPT group should not be much of a surprise; given that this group's main constraint is capital availability and given that parts of the land are underutilized precisely because of these capital constraints, a cheap way to obtain project payments without having to invest much capital or labour has been the simple regeneration of 'low pressure' or underutilized parts of the farmers' land into *tacotales*. Considering that such land is converted regularly into new productive land uses as part of a slash-and-burn system of fertility regeneration, the project payments might have just created a little more space for leaving land fallow for a longer time.

Beyond Direct Project Incentives: Revealed Motivations for Land Use Changes

In our field interviews most farmers claimed to have changed land use for a number of differing complementary reasons. Payments were a welcome additional incentive but, according to the farmers, did not play a decisive role. Surprisingly, they attributed much more importance to the provision of TA, which deepened their knowledge of silvopastoral practices and strengthened collective motivation to engage in silvopastoral intensification, connected to the ongoing milk boom (see below). Various other studies have emphasized the importance of TA in the adoption of silvopastoral practices (see Pattanayak et al., 2003 for an overview). Although most farmers in Matiguás-Río Blanco already knew and used some of the silvopastoral techniques, the TA and the social momentum it generated were said to have stimulated experimentation with new, or expansion of already-known practices and at the same time to have lowered the perceptions of risks.

At first sight, the quantitative project data (Table 3) do not seem to provide any evidence that TA played such a decisive role. Comparison between the PES and PES+TA group does not reveal significant differences in adoption rates. However, since the experiment did not take place in a laboratory but in the real world, where farmers cannot simply be isolated from other interconnected community members, participants (not receiving TA) inevitably acquired new knowledge by interacting with other participants (who were receiving TA); they experienced demonstration effects from neighbouring farms and sometimes even attended workshops as substitutes for eligible participants (with TA). Moreover, several other extension organizations were

active in the region, some joining the RISEMP momentum and offering TA services similar to those of the RISEMP. Rather than being an indication that TA did not have an effect, this suggests that the adoption of new practices is not solely dependent on individual cognitive capacities and decision making, but is also supported by the emergence and articulation of sufficient social momentum crystallizing into coherent collective action that enables collective pathways of change (de Haan and Zoomers, 2005).

Apart from individual and collective project incentives, there have also been strong exogenous incentives which have motivated producers to intensify their farming activities. The main incentive derives from the boom in the national milk market and improved local access of farmers to fresh milk collection centres and (semi-)industrial cheese factories. This has translated into higher demand for milk and a significant increase in regional milk prices. There is also a widespread perception that this rise will continue in the future as a result of recent free trade agreements that will reduce barriers to lucrative export markets, including the USA. In order to benefit from these opportunities, dairy farmers need to keep (and feed) their milking cows close to the roads, where milk is collected. Milk collection centres — owned by or connected to cheese exporters and national processing plants with a strong interest in maintaining year-round production — pay a significant price premium for a stable supply of milk. Stability of supply means avoiding the usual decline in milk production as a consequence of lower food availability during the dry season. Since the more productive milk cattle breeds are less resistant to heat than the traditional meat cattle breeds, they require the protection of shade from trees. At the same time (and partially as a consequence of these processes), land is becoming scarce and increasingly expensive. Collectively, these factors provide private producers with good reasons to invest in natural or improved pastures with/without trees and fodder banks.

In conclusion, although payments have covered a substantial part of the investment costs and have probably played a positive role in motivating and enabling beneficial land use change, the motivation for this change is located in a broader process ensuing from the exogenous incentives created by the milk boom and the related social momentum of knowledge creation and social learning. This provides an indication that farm decisions, whilst clearly affected by market conditions and individual cost–benefit calculations, are also dependent on more diffuse change processes that are collectively deemed beneficial for economic and possibly other reasons. Payments have been welcomed by all farmers, and are likely to have been a real as well as a symbolic factor in creating collective and individual motivation for silvopastoral intensification. Yet, in the absence of credit constraints, many of the investments would probably have taken place anyway, precisely because they 'made sense' economically and socio-culturally. In our interviews, farmers claimed that the project did not alter their farm management strategies and that it only promoted the faster adoption of practices which they were already adopting — or at least trying to adopt. Project payments

might thus have played a less prominent role in behavioural change than expected or claimed. Underlying financial profitability and connected cognitive and social network dynamics might have equal or greater importance as elements of the broader pathways of change.

CONSERVATION THROUGH THE MARKET? THE LINK BETWEEN MOTIVATION, CONSERVATION AND INSTITUTIONS

Beyond our immediate empirical re-assessment of the 'success of PES' in the RISEMP project, we can now place our findings in a broader theoretical discussion of the potential and the limitations of the market-based PES approach to conservation.

A first thing to note is that conceptually market-based approaches, almost inevitably, build upon the rational actor paradigm, assuming that people act upon an individual calculus of what maximizes their self-interest, or at least that we can model human behaviour as if it were solely based upon such a self-interested optimization exercise. Following this model, it is assumed that people will not undertake environmentally-sound actions unless they contribute to their private utility. Market-based approaches also tend to attribute unrestricted property rights to farmers such that the ES that they provide can be treated and rewarded as positive externalities, rather than at least some of them being considered the result of the normal care of natural resources that could be expected of farmers.[9]

In a market-based approach such as applied in the RISEMP, the purpose of PES is thus logically to alter human behaviour by affecting the (monetary) incentives, thereby creating an extrinsic motivation for the introduction of more environmentally-sound practices. This is achieved by altering the relative prices that determine the profitability of underlying economic activities (Frey and Stutzer, 2006). However, this reliance on extrinsic motivation overlooks the fact that institutions — in this case a market-based institution — cannot be treated as mere neutral transmitters of incentives. They also influence and interact with people's intrinsic motivations, which are related to their sense of enjoyment, satisfaction, (social) responsibility and/or obligation (Reeson, 2008). Intrinsic motivation cannot be treated as exogenous and fixed. This interaction of external monetary incentives and people's intrinsic perceptions, values and social norms needs to be recognized. As Reeson explains, 'the way in which a situation is perceived can determine the extent to which intrinsic motivations are applied' (ibid.: 18). With respect to the PES approach, the framing of agricultural decision making in an implicitly individualistic, full private property rights set-up, in which private producers need to be rewarded for the ES they provide, obviously

9. See Van Hecken and Bastiaensen (2009: §5.3) for a more detailed discussion of issues related to the definition of externalities.

tends to affect intrinsic motivations, with respect to both the prevalence of minimum social norms regarding responsible natural resource management, and the individual value of the enjoyment and satisfaction derived from the existence of natural resources.

Some scholars fear that the penetration of market logic for ES provision entails the risk that extrinsic price incentives erode intrinsic motivations, leaving the ultimate outcome for responsible natural resource management indeterminate (Frey and Oberholzer-Gee, 1997). In the same vein, Vatn (2005: 215) emphasizes that 'people apply different behaviours in different institutional settings' and Reeson and Tisdell (2006: 20) argue that the introduction of market logic may 'trigger people to behave in a self-interested way, rather than in the more cooperative or reciprocal ways in which they behave in other situations'. The danger is that the ensuing 'motivational crowding-out' (Frey, 1997) will destroy existing environmental ethics and associated social practices of co-operation and mutual control, thereby engendering significant 'hidden costs of rewards' (Lepper and Greene, 1978).

From the same pessimistic perspective, Heyman and Ariely (2004) analyse this problem in terms of the erosion of 'social markets'. In such 'social markets', individual efforts and co-ordination are based upon mutual exchanges embedded in social relationships and prevailing social norms and values. Introducing a market institution changes the locus of responsibility and leaves the choice up to the individual land users who will make their (uncoordinated) individual environmental efforts conditional upon receiving sufficient compensation. For example, the decision of a land owner to cut down trees, which in present-day Nicaraguan law is an illegal act, could become justified by the foregone monetary payments of this 'improved' land use (*mejoras*), since the principle of (foregone) monetary compensation implicitly contributes to legitimize such illegal land use practices (Ravnborg et al., 2007; Young et al., 2003) as it attributes to the farmer a *de facto* entitlement to destroy trees. The associated change of individual perceptions can also imply 'that landholders will come to expect to be paid for actions they are currently doing voluntarily' (Reeson, 2008: 20) or, even worse, that they could start to use the 'environment as ransom' (Young et al., 2003), threatening to excessively mine the available natural resources unless they receive monetary compensation for not doing so. During field research, we found worrying indications that such an unanticipated effect might be taking place in certain areas of the RISEMP region where the PES idea has been widely publicized. In a neighbouring nature reserve, which plays a critical role in the local urban water supply, farmers are at present strategically expressing this threat, allegedly demanding compensatory PES for protecting the remaining forests on their properties. Anticipating the possibility of a (municipal) PES system (such as exists in the neighbouring municipality of Río Blanco), they have moved to create a local environmental association, in order to capture any future natural resource rent from PES and other environmental initiatives. In this way, the introduction of market logic could indeed

lead to 'token economies' (Frey and Stutzer, 2006) in which people expect to be paid for actions they previously did out of moral obligation and/or social pressure. Another possible effect is that the existing social institutions that co-ordinate and manage practices related to the environment might start to exert less influence. As noted by Wells (1998: 830), 'there is a danger that existing institutional actors may take less responsibility for biodiversity if they see a new institution created for this purpose'.

The phenomena of unanticipated motivational crowding-out and the erosion of 'social markets' would raise serious doubts about the effectiveness and sustainability of PES and ES markets. Indeed, because of these neglected feedback effects it would no longer be self-evident that the introduction of payments would have a net positive effect on ES provisioning. The creation of PES mechanisms might actually do more harm than good, if the motivational crowding-out effect outweighs the relative price effect and/or if existing social institutions disintegrate under the pressure of the penetration of market logic. Even if the net effect is positive in the short run, there are still justified concerns about the long-term sustainability and thus the ultimate effectiveness of the programme. A reliance on extrinsic monetary incentives implies that payments would indeed need to be ongoing, rather than short term (Pagiola et al., 2002). If the resulting increase in environmental funding levels cannot be sustained, payments might decline or disappear, leaving destroyed environmental ethics and weakened social institutions. This might lead to a scenario similar to the effects of the substitution of community management of natural resources by state command-and-control, now widely recognized as disastrous, in which the failure of state governance resulted in a shift from more or less effective local governance to *de facto* open access (Ostrom, 2002).

A key issue is the extent of any pre-existing intrinsic motivations and social norms that contribute to environmentally-sound practices. If these are few, there is not much to destroy in terms of 'social markets' and 'intrinsic motivation'. On the Nicaraguan agricultural frontier, a strong individualistic peasant work ethic prevails, collective action and mutual control are often weak, and — as mentioned above — the historically dominant logic with respect to the environment was to consider trees as a hindrance for production and cleared parcels as *mejoras* (improvements) (Bastiaensen et al., 2006: 15–16). In a context of gradually changing local perceptions, a positive interaction between extrinsic and intrinsic motivation might also exist; in that case, the PES signal that environmental protection is highly valued by outsiders who are willing to pay significantly for it, could support changes in local perceptions, values and norms concerning 'accepted' and 'desirable' agricultural practices. Although the region of Matiguás remains — in both a physical and a cultural sense — far removed from the urban society of the capital and the 'developed' world, ecological messages of endangered species, climate change and increasing pressure on water and forest resources have found their way to local cultural arenas, mainly through schools,

television[10] and the discourse of some development organizations. While many producers find it hard to believe that anyone wants to pay to keep trees, exposure to the global discourse of ecological catastrophe gives a better understanding of where this international willingness to pay is coming from. Add a number of local examples of ecological crises, in particular increasing scarcity of water and heightened incidence of draughts and floods in recent years, and it is clear that local norms and values related to the environment might be susceptible to change. In this context, positive 'motivational crowding-in' through PES rather than the alleged 'crowding-out' does not seem impossible. It remains quite unlikely, however, that individualized PES payments alone could contribute to the strengthening and emergence of more environmentally-friendly norms and 'social markets'.

Our case-study material found differences in the 'rate of success' in adopting the silvopastoral practices between different communities of the RISEMP area, suggesting that PES payments can be expected to have most impact when they are tied into existing or emerging local environmentally-responsible institutions. In one community, with a tradition of strong local organization and relatively high degrees of co-operation and mutual trust, there were pre-RISEMP local institutions for environmental governance (such as a local committee to protect critical areas for water supply). Other participating communities had very low levels of organization, higher levels of disarticulation and distrust; and very weak or no local institutions for environmental governance. The first community picked up the pro-environmental discourse of the RISEMP much more effectively than the other communities. Individual PES payments thus need not be detrimental to non-market environmental governance. In the case of the RISEMP, and in line with our previous interpretation of its success due to its articulation with a broader pathway of change, the best local setting for PES to have an impact was the village with the highest institutional capacity.

A market-based PES approach might thus thrive most in a dynamic context of motivational and institutional reinforcement. From both a pessimistic and an optimistic viewpoint, it seems irresponsible to rely uncritically upon the ES market as the 'magic bullet' for saving the environment. There is a clear need to take account of the whole socio-institutional landscape before 'pushing' the provision of ES in a market framework only. It is important to approach human beings not simply as selfish utility maximizers, but to take due account of the existence of environmental ethics and of how the latter can be further developed and utilized through deliberative institutions that enable co-operative actions and foster what Agrawal (2005) has called 'the making of environmental subjects'. Vatn (2005: 215)

10. With solar panels, television has now reached even the most isolated communities, and cell phone technology is bringing internet and cable television within reach. Even rural Matiguás is thus rushing into the global society.

rightly emphasizes that 'choosing policy instruments is thus not simply about changing incentives. It is about instituting certain logics, about understanding which institutional frames people apply, and about influencing these frames'. Inspired by Cleaver (2002), we therefore believe that the crafting of an acceptable mix of institutional solutions requires a complexity-sensitive, site-specific, path-dependent and ongoing 'bricolage'[11] towards better local–global institutions.

CONCLUSION

This article started by recognizing that the PES approach provides an innovative, appealing and attractive narrative about the causes and possible market solutions to the problem of the under-provision of ES related to agricultural activities. Yet, despite the claims of PES advocates that their approach is both theoretically well founded and applicable in practice, our study has indicated that a narrow market-based approach might not adequately explain the dynamics that are taking place, nor does it automatically contribute to effective and sustainable improvements in ES provision. In the practice of the RISEMP, PES payments interacted with exogenous economic factors and broader local institutional processes, which together generated renewed and environmentally-sound collective pathways towards intensified silvopastoral milk production. The PES payments were an additional objective and symbolic factor in this broader dynamic.

We also indicated that the spread of the market-based logic of monetary rewards might tend to erode existing environmental ethics and social norms, unless PES is matched to effective local institutions enabling it to promote 'motivational crowding-in'. This leads us to conclude that despite the apparent attractiveness of the PES story, it could eventually do more harm than good, especially if it promotes the market as a superior solution which can and should replace 'ineffective local or state governance'. A more sophisticated and ideologically flexible approach that recognizes the advantages and disadvantages of 'market', 'state' and 'community' governance as well as their varied and complex local manifestations in each particular circumstance, and that modestly tries to generate ways to build better institutional mechanisms which improve overall outcomes, might thus be more appropriate. As an expression of joint (world) responsibility for the limited natural resources of our planet, the principles and mechanisms of PES and ES markets can still be part of improved institutional governance, but a narrow individualistic market-based application should certainly not be treated *ex ante* as the superior governance alternative.

11. Cleaver (2002: 16) uses the term 'institutional bricolage' to 'suggest how mechanisms for resource management and collective action are borrowed or constructed from existing institutions, styles of thinking and sanctioned social relationships'.

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