World Agroforestry Centre

Payments for ecosystem services:
Evolution towards efficient and fair incentives for multifunctional landscapes

photo: Beria Leimona

RUPES series

Key findings	Implications
• A multi-paradigm approach to conducting PES schemes may be most effective	• PES practice needs to be understood as an interface of pico-, micro-, meso-, macro-, and gigaeconomics, where multiple discount rates, efficiency concepts, and brain systems interact to understand how monetary or other incentive types impact on pro-social motivation and collective action.
• Co-investment paradigms, understanding PES as a negotiation support scheme - may work in the absence of clear property rights and can contribute to conflict resolution and articulation of rights, paving the way for further ecosystem service performance-based contracts.	• PES needs to address beyond financial incentive as payment. The challenges beyond financial payments can include lack of clear tenure, lack of land, high transaction costs, and high up-front investments needed to adopt new land-use practices – that may restrict low-income households from access to PES projects. To establish effective PES schemes, external coinvestment – through incentives from global programs, such as to reduce emissions from deforestation and degradation (REDD) and ecocertification – needs to synergise with local efforts through understanding local dynamics and conditions for free and prior informed consent.
• Financial incentives can both support and undermine social norms compatible with enhancing ecosystem services. Providing financial incentives to individuals can lead to crowding out social motivation and can have negative effects on ecosystem service delivery. However, no conclusions can be drawn because of a lack of empirical evidence of PES.	• Scientists need to conduct more research, particularly on how incentive influences behavior, to better understand what attracts one audience to take part in PES and repels another.

Introduction

This review analyses the concept of Payment for Ecosystem Services (PES) in the context of developing countries and explores the way paradigms and approaches are perceived and influenced by countries with different histories of land-use patterns, land ownership, tenure regimes, rural population densities and degrees of market integration.

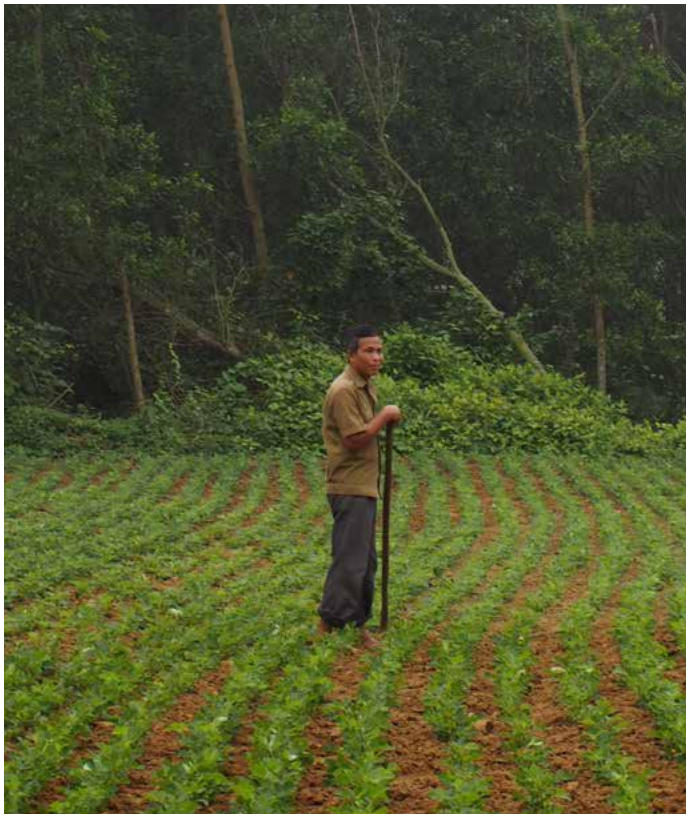
PES can be understood through a "negotiation support" perspective where multiple knowledge and value systems interact and shape a negotiation platform and its outcomes.

This study believes that five economic scales and three aspects of human brain function (systems one, two, and three) need to be reconciled to understand how individual behaviors and choices interact with local actions, their global consequences and the opportunities for effective feedback mechanisms.

The five scales of economic analysis are as follows. Only micro and macroeconomic analysis have been conventionally studied:

- Picoeconomics (or neuroeconomics underpinning behavioral economics): Considers individuals' brain synapses, which involve-decision making, interpretation of observations and construction of perceived causal mechanisms.
- Microeconomics: Considers household and farm enterprises with the cash flows and investment issues at that scale as influenced by market function and the totality of taxes, subsidies and regulations.
- Mesoeconomics: Covers landscape, community and local governance scales and also private-sector actors where determinants of ecosystem services interact with the paradigms of integrated rural development.
- Macroeconomics: Where nation-states, as part of regional cooperation arrangements, are at the interface of world markets, political ambitions for development, and the economic decisions of subnational actors, which respond to taxes, subsidies, regulations and public investment in physical infrastructure.
- Gigaeconomics: Revolves around earth system management and the rediscovery that humans can care about their broader context if appropriately primed and motivated by concepts such as "footprint".

PES discussions usually focus on the role of positive incentives (carrots) at the interface of meso- and microeconomics, but the involvement of other scales is increasingly recognised.



The discussion on the role of positive incentives (carrots) until recently only focusing at the micro and meso-economics, but the involvement of other scales is increasingly recognised. (photo: Robert Finlayson)

The three brain systems are as follows:

System One:
Brain function that is rapid, intuitive, subconscious and synthetic, and that leads the primary response of humans to opportunities and choices.

System Two:
Brain function that is slow, rational, conscious and analytical, leads problem analysis and rationalises choices.

System Three:
This brain function complements systems one and two and reflects social norms to which an individual complies.

Market-based schemes

PES can be conceived and implemented by a government-mediated institution without explicit reference to markets. Compensation adjustments to what taxpayers are willing to pay will, over time, provide a coarse feedback mechanism to adjust supply to demand.

Much PES literature, however, suggests that market-based schemes to enhance ecosystem services will be more efficient through monetising or commoditising biodiversity conservation, watershed protection and carbon sequestration. PES schemes depend on funds

PES needs to address beyond financial incentives as payment (photo: Kevin Jeanes)

derived from direct beneficiaries of such services, in the case of commodification, and/or an increased public interest to support conservation, regarding compensation.

In the latter case, funds are used to compensate for involuntary or voluntary restrictions on land use. They aim to be sufficient to offset the opportunity costs of forgoing private benefits from legal activities with negative environmental effects. In a market-based approach of enhancing environmental quality through freely negotiated forms of PES, the bargaining position is crucial.

Where the potential supply of ecosystem-service delivery contracts is less than demand, ecosystem service providers can negotiate prices beyond the compensation for opportunity costs. If demand for these contracts is less than the potential supply, the market may settle on a price that is at about breakeven level for ecosystem service providers.

Commodification with price levels reflecting current supply and demand can work where the time lag for increasing supply is less than the timescales at which demand varies and where production decisions are reversible. Few, if any, ecosystem services meet these requirements, and the mechanisms to set price levels must reflect longer-term societal values, rather than the economic mood of the day.

Definition of PES

Much literature about PES focuses on identifying the payment level needed to change land use, targeting land users, structuring payments and contracts, creating effective public-sector and private-sector arrangements, and designing public policy.

However, few empirical studies so far have described the medium-term impact of PES on a) the land managers, b) the social system they are part of, and c) the ecosystem services targeted.

Some of the first PES efforts in Southeast Asia and Africa are now reaching a point where these issues can be studied empirically.

The most highly cited definition of PES is, "A voluntary, conditional transaction where at least one buyer pays at least one seller for maintaining or adopting sustainable land management practices that favor the provision of well-defined environmental services."

The definition applies binary, qualitative standards to the concepts of conditionality, well-defined ecosystem services and voluntarily agreed contracts at the level of individual buyers and sellers.

Strict application of the definition may lead to the conclusion that PES does not currently exist in pure form but that there are similar PES approaches that approximate the ideal to various degrees.

The same may be true for the majority of economic theories, but the binary definitions can also be replaced by sliding scales of the degree to which realistic, conditional and voluntary contracts of the provision of well-defined ecosystem services are negotiated and implemented, with additional attention on the fairness dimension of "pro-poor" approaches.

On the basis of variations in the way the criteria are met, three complementary paradigms can coexist within a broad PES framework:

a). Commodification of well-defined ecosystem services so that buyers and sellers can negotiate prices (CES).

b). Compensation for opportunities forgone voluntarily or by command and control decisions (COS).

c). Coinvestment in environmental stewardship as key features (CIS).

The basic premise of PES is that payments (flows of financial capital) are the primary vehicle through which the buyers can express their appreciation for the ecosystem service.

As long as the sellers keep producing the ecosystem service, it is up to them how they use this financial

capital: To invest in natural capital, quality of houses, means of transport, or savings accounts or to pay for schooling of children, healthcare, amenities, and luxuries of life or any other expenditure.

In practice, however, buyers may be disappointed if sellers do not invest a considerable share of payments into direct enhancements of natural capital; they expect a "multiplier effect".

Buyers of ecosystem services are not willing to forgo their control, at least partly, because the production function of ecosystem services as emergent properties of complex landscape systems is not well understood.

The prescriptive PES definition referred to at least one buyer and seller exchanging ecosystem services for money, with Pareto efficiency determined by the relative shortage of ecosystem services and surplus of financial capital on the buyer side, and reverse endowments on the seller side.

In practice, most of the currently known PES applications in the tropics involve linking complex systems in buyer and seller communities that involve exchanges of multiple asset types.

Contracts involve investments and linkages in social capital and individual human capital. The initial currency may be recognition and respect as social capital exchanges, rather than money. When taken to its full consequences, this implies that the buyers and sellers become coinvestors in cross-linked systems.

Ecosystems and market functions

To get ecosystem services into the domain of market functions, the spatial and temporal scales at which performance can be measured are important to consider for contracts.

For goods, there is typically a value chain in which the price-per-unit substance shifts with processing, transport, quality control and branding. However, there is a clear relationship between the units in which end users buy or consume goods and the way they are produced.

For most ecosystem services, such a relationship is lacking. What is one unit of watershed function apart from water quality? What is one unit of biodiversity apart from the populations of specific, flagship species? Carbon stocks and greenhouse gas emissions are relatively easy to quantify, as they scale with area, in contrast to watershed functions and biodiversity, which have fractal dimensions on a length scale other than the 2.0 of area-based scaling.

Most PES arrangements cannot manage the actual services but have to accept proxies, such as the condition of land cover that is supposed to enhance ecosystem services.

In other cases, they have to take a step further back towards the human actions taken that affect the condition of the land. In many cases, trees and forests are associated with perceptions of ecosystem services, but the evidence on which this is based may be relatively weak when held to scientific scrutiny. Also, the contrast between forest and non-forest agricultural lands in terms of tree cover is less than often perceived.

However, the type of trees and lack of the "right tree at the right place" concepts may limit actual ecosystem service enhancement where tree cover is used as proxy.

An interesting alternative to directly commoditising ecosystem services (CES, of which the CES paradigm may be split into CES1 and CES2, accordingly) is to tie ecosystem services to existing commodity flows.

Eco-certification in its various forms is doing just that. It usually implies an aggregated ecosystem-service concept rather than sharply defined separate ecosystem services and leaves the details to

Experimental auctions can be used to bring closer the PES into market domains, in which the ecosystem services provider and buyer can negotiate on the temporal and spatial scales of PES contract performance (photo: RUPES team)

interactions between producers (farmers) and the design and quality control agency of the certification process. However, multiple standards tend to compete for consumer attention and introduce a market element in shaping operational rules for certification.

PES engagement

A survey of the business case of existing PES in the Philippines with in-depth interviews of public and private enterprises engaged in PES showed that most companies saw a clear business case for them to make such payments, but the business case consisted largely of the need to maintain relations with government authorities whose consent they needed to continue operating permits.

Early investors in PES in Kenya included flower growers in Lake Naivasha area whose business case depends on export markets and associated customer perceptions in European markets. In this sense, ecosystem services probably relate to customer loyalty in the same way as other service dimensions, via an aggregate corporate image in the system one brain of customers.

Numerous experimental studies have found that monetary incentives crowd out alternate sources of motivation to perform a task or engage in pro-social behavior.

These studies have found that small payments can in fact reduce levels of desired behavior relative to a baseline and that, when payments end, the level of the desired behavior reduced below its baseline before payment was introduced.

This body of research, which is largely outside the realm of natural resource management, raises the question of how the utilitarian framing of ecological concerns and market strategies can modify the way humans perceive and relate to nature. PES researchers need to conduct more conservation studies to help gain a better understanding into how much monetary incentives are more likely to have positive or counterproductive effects in reward-based initiative to conserve the environment.

Commons literature argues that groups must build trust gradually to function. In addition, in many cases pro-social motivations among individuals are rooted in intrinsic motivators, such as long-standing traditions or norms that favor collective action or concern about self-image or public image.

Where collective action is driven by social, non-pecuniary norms, introducing monetary incentives can undermine the social norms and thus weaken instead of strengthen collective action.

Understanding PES and pro-social motivation

Although such studies were not undertaken specifically for PES, they point to a need for more research to understand how monetary or other incentive types interact with pro-social motivation and collective action. The emerging experience with auctions of ecosystem services contracts in a developing country context suggests these are social interactions of a rather complex nature, rather than simple experimental procedures to establish a correct price.

PES literature often highlights a potential compatibility between environmental conservation and poverty reduction, especially when low-income households are contracted to receive payments in return for their conservation efforts.

An important reason behind this premise is that, in many developing countries, landscapes that can provide many ecosystem services are also home to

Scientists need to conduct more research to understand what attracts one and repel another to take part in a PES scheme (photo: RUPES team)

Coffee farmers was awarded with certificates of land stewardship under the community forest management (HKM) scheme for conserving the state forests in West Lampung (photo: Noviana Khususiyah)

a high proportion of low-income people. However, it would be simplistic to assume that low-income people can easily participate in such PES projects or that they will benefit significantly once incentive payments are disbursed.

Indeed, strong barriers may restrict the extent to which poor households can access PES projects. These include lack of clear tenure, lack of land, high transaction costs, and high up-front investments needed to adopt new land-use practices.

Low-income people often do not have secure land titles, which may prevent them from obtaining PES contracts. This is especially true for carbon sequestration services, where payments are tied to the intended permanence of the service. Without a clear land title, it may be difficult for those without title to convince buyers that they can ensure the flow of services in the future. Landless low-income people or those without title may in fact be ineligible to participate in such PES programs.

In the case of rented land, tenants cannot make commitments regarding long-term land use without input from the landowner. Also, if the possibility of ecosystem service payments makes the land more valuable, the landowner may either increase the rent or discontinue the lease, possibly impacting upon the renter's livelihood.

In a PES study of a local community in Mozambique, levels of per capita payment and effective impact were small when compared to increased employment benefits from developmental activities of the project. In contrast, reward provision in the form of long-term tenure security for local farmers in Indonesia, has positively impacted on households' livelihoods.

This shows that the interaction between PES and poverty is still far from well understood, and more empirical research is needed to understand the poverty-environment nexus.

Non-financial payment potentially opens access to critical livelihood capitals that might be

lacking within the ecosystem service provider communities. This type of payment is usually considered as indirect and patronising, whereas cash payment is frequently seen as more flexible and allows ecosystem services providers to convert it to local goods and services.

PES case studies in Asia and Latin America indicated that non-financial payments were preferred by some of the local communities because they had limited capability regarding investment, savings and entrepreneurship.

Observations in developing countries reveal that both financial and non-financial payments might face complex bureaucratic and highly contagious collusion because PES governance is still unclear, formally and informally. However, this situation might be contextual as an Indonesian case in the Cidanau watershed showed that a cash payment successfully transformed into an independent small-scale business and infrastructure: Developing a simple piping system resulted in public access to clean water.

PES was conceived as an alternative or a complement to government programs, giving a greater stake to local communities and land users, with a simple way to convey the relative merit of various alternative land uses through the details of the conditionality clauses in a contract. We may have, however, come full circle

back to the concept of *Investing in Natural Capital: The Ecological Economics Approach to Sustainability*.

The financial transfers that have so far been effectuated are far below the "true value to society" that studies such as The Economics of Ecosystems and Biodiversity or TEEB are documenting.

This might imply that the current framing of ecosystem services is less universally shared among stakeholders than assumed and that it needs to be further contextualised. Referring back to the five scales of economic analysis, we have so far seen that PES was initially perceived as primarily aiming to bring microeconomic decision-making at the individual, household or farm level in line with the longer-term interests at meso- or macroeconomic levels.

Much of the discussion so far has been on the recent advances in picoeconomics of decision-making when humans are offered choices. From the other side of the scale of gigaeconomics, an equally important challenge arises because future resource scarcity needs to be properly weighted. If temporal scaling (discount rates) differ, it is unrealistic to expect any single price to emerge as reflecting a true value.

Although microeconomics (system two brain functions) operate at apparent discount rates that relate to the costs and risks of borrowing money, system one is channeled for instant rewards, preferring what is in front of one's eyes over almost any promise of larger amounts in a near future. At the same time, picoeconomics respond strongly to social norms (tentatively labeled as system three, here). The interactions with systems one and two require further study. Financial motivations tend to win out when social and financial motivations are mixed in experimental settings, and the way pico- and microeconomic spheres interact is not understood completely.

Conclusion

In practice, many terms will have negligibly small values for many of the agents/decision makers, but we can see that there are multiple entry points for nudging decisions towards greater ecosystem service performance: (i)increasing knowledge of costs and benefits to others of actions and decisions by the focal agent; (ii) increasing affinity and sense of belonging; (iii) is modifying the implicit weighting factors across capital types; (iv) varying the discount rate component reflecting the scale and its associated risk aggregation, and (v)varying the discount rate component reflecting the type of capital.

A CES paradigm of cross-national carbon trade is feasible. Between a national scale and its subnational entities (sector-based or geographically defined), a COS paradigm of compensating for choices on the development/environment possibility frontier is appropriate.

At the local level, a CIS paradigm is appropriate and can be used to create comanagement regimes and greater clarity in resource use rights.

To establish effective PES schemes, external co-investment through incentives from global programs (i.e. REDD+ and ecocertification) needs to synergize with local efforts through understanding local dynamics (photo: RUPES team)

A multi paradigm approach may be most effective to conduct PES schemes. It implies to understand PES practice as an interface of pico-,micro-, meso-, macro-, and gigaeconomics where financial and non-financial incentive impact on social motivation and collective action (photo: RUPES team)

A multi-paradigmatic approach appears to be logical: At the national scale, property rights are clear (national borders); performance measures at this scale have absorbed most of the cross-landscape leakage; and permanence can focus on continuity of accounting rules at aggregated levels.

A key challenge, however, is to maintain transparency in such a multi-paradigmatic approach, given the tendencies to elite capture, low accountability (corruption), and election-cycle political biases. There is some evidence that supports these ideas, but a critical global comparison is needed.

Finally, at the gigaeconomic scale, the concerns for planetary boundaries and the need for more targeted, rapid, transparent and innovative feedback loops remain urgent, as current feedback does not keep up with the rate of change in the planet earth system.

The expectation that PES could provide flexible, effective and fair feedback loops has only partially been met. While from buyers' perspective, for example, the uban consumers face a larger diversity in their food choices and more security in drinking water supply than probably at any time in human history. While they can fully saturate their appreciation of existence value by what they see on television, they can easily ignore the messages about a loss of ecosystem services.

Some 20 years before the 1992 Rio conference, advice to the Club of Rome called for "Reshaping the International Order [RIO]". Two decades later, a call to reshape the international order is as urgent as it was then. Unless global agreements and policies set the pace and clarify the boundaries, market-based ecosystem service approaches will only serve subsystems.

This study analyses the research so far in to the prospect of PES to serve as a panacea for the alignment of ecology and economics. The optimist will note how far we have progressed. However, while the realist will appreciate the progress made, they also see the pace of progression as needs speeding up.

Citation

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