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# Ecosystem Services in the Tropics: Challenges to Marketing Forest Function

## PART I - THE SCIENCE OF CONSERVATION: QUANTIFYING FOREST FUNCTION

### Environmental Services of Native Tree Plantations in Central America

***Florencia Montagnini, Professor in the Practice of Tropical Forestry, Yale School of Forestry & Environmental Studies***

The Central American wood market has traditionally relied on natural forests. With the advance of deforestation in recent years, several countries have supported the establishment of plantations to help alleviate the increasing pressure on natural forests. Some countries have recently started programs of incentives to encourage plantation development. For example, in Costa Rica, Payment for Environmental Services (PES) contributes to plantation establishment through the assignment of differential subsidies for already established plantations and for new reforestation. Funding for these subsidies comes from a special tax on gasoline, and from external sources sought by FONAFIFO (National Fund for Forestry Financing), an institution charged with the specific task of seeking financing for these types of programs.

Generally these plantations are established on degraded land by private farmers who are often advised in terms of species selection, plantation silviculture and subsidy procurement, by local NGOs (e.g., FUNDECOR, Foundation for Development of the Central Mountain Range) or by research institutions with practical experience in the region (e.g., CATIE, Tropical Agriculture Research and Higher Education Center). Therefore gathering existing information and obtaining new data on species selection, plantation silviculture, and environmental services provided by plantations is important to the success of these programs. These programs can also serve as a model for starting or modifying similar programs in other countries with comparable ecological and socioeconomic conditions.

In addition to supplying the growing demand for wood, plantations provide environmental services such as carbon sequestration and recovery of plant and animal diversity. This paper presents experiences with native species plantations, in pure and mixed designs over the past 12 years in Costa Rica. Data on volume, biomass production and recuperation of biodiversity are presented. We recommend the establishment of government incentives for reforestation with native-species plantations, based on results described in this paper.

### Keystone Molecules and Ecosystem Services in Tropical Forests

***Manuel Lerdau, Associate Professor, Ecology & Evolution Department, Institute for Terrestrial and Planetary Atmospheres, State University Of New York***

The concept of Ecosystem Services has had a profound influence on conservation efforts since its introduction to the literature 20 years ago. To a large extent, efforts to identify quantify, and place a monetary value on these services have focused on those processes that integrate biological activity across organisms within an ecosystem, e.g., carbon uptake by an ecosystem is the integration of photosynthesis and respiration by the member organisms. In contrast, many conservation biologists, and most conservation efforts, focus on particular species, usually rare or endangered ones. For the full potential of Ecosystem Services to realized in conservation efforts, we will have to combine the species-level focus of traditional Conservation Biology with ecosystem scale measurements.

I propose that certain key processes, particularly organic carbon flux from plants to soils and the atmosphere, are processes that fit this criterion. They are crucial for ecosystem dynamics and they show large levels of variability across taxa. In this paper I develop a strategy for uniting Ecosystem Services with the taxon-based focus of traditional Conservation Biology, using the example of organic carbon flux from plants. I demonstrate that deforestation and the establishment of forest plantations have profound impacts on organic carbon flux from plants to the atmosphere, even though the impacts on bulk carbon exchange may be minimal. This organic carbon is highly reactive and acts as a keystone molecule in atmospheric chemistry, affecting atmospheric properties far out of proportion to its abundance and altering the ability of the atmosphere to remove important pollutants.

Although this paper highlights organic carbon fluxes because organic carbon acts as a keystone molecule in the atmosphere, other processes that involve other particular molecules are also likely ideal loci for uniting the study of Ecosystem Services with taxon-focused Conservation Biology. Other processes that are likely to show a high degree of taxon specificity include nitrogen fixation, and the production of available inorganic phosphate. In general, symbiotic relationships that involve the oxidation/reduction of specific molecules are good candidates for studies of Ecosystem Services and Conservation.

### Ecosystem Services in Shaded Coffee Landscapes: Native Tree Conservation and Water Provision

***V. Ernesto Méndez, Department of Environmental Studies, University of California, Santa Cruz***

In the last decade, shaded coffee agroecosystems have been attributed the potential to provide a variety of ecosystem services. Research has documented the importance of this agroecosystem for the conservation of plant and animal biodiversity, and potentially, carbon sequestration, water and soil conservation. Most of these studies have only focused on the ecological dynamics of these agroforestry systems. There are few interdisciplinary studies that integrate biophysical characteristics with the socioeconomic conditions of farmers. This paper aims to relate the potential of shaded coffee to conserve native tree biodiversity, with household livelihood strategies and farmer cooperatives

Research in Tacuba, El Salvador, is underway since January 1999. The site was chosen for containing several types of cooperatives, and for its ecological importance as a buffer zone to Parque Nacional El Imposible. The three cooperatives analyzed had distinct characteristics in their origin, history and function, but similar biophysical conditions. Fifty-one 1000 m2 plots for agroecological research were randomly or systematically laid out in the three cooperatives. Data on social organization and livelihoods was collected through 52 household interviews, and at least 15 focus groups.

Household livelihoods of cooperative members were affected by low incomes and a lack of basic social infrastructure. Economic activities were still relying mostly on agricultural work relating to coffee. Shade trees produced a diversity of products that were used both for household consumption and sales. Given the low incomes reported, this contribution was perceived as significant for the household economy.

Cooperative members showed different perceptions of their organizations. These ranged from perceiving the organization as an employer; to believing it is the only means to overcome poverty. These opinions seemed to be the result of the origin, size, history and structure of the organizations. Coop. 1 with its larger size and history still faces many internal conflicts, although it has extended its networks with relevant outside actors. The smaller cooperatives have more close-knit relationships and in general members believe in improving their livelihoods through their organizations.

Complete inventories of the plots yielded a total of 169 different tree species. Of these, 123 have been identified, and they represent 46 families (96 native, and 14 exotic). Tree species diversity was lower, but similar to that found on a recent study on the nearby Imposible National Park (total of 174 species in 28 plots). Only 24% of the 123 species identified were shared by the three cooperatives, showing relatively low values for the Jaccard coefficient of community similarity.

The levels of native tree biodiversity found in the cooperatives show promise for conserving these species within shaded coffee plantations. However, the integration of cooperatives into conservation strategies need to ensure these initiatives will not negatively affect their socioeconomic situation. Special attention should be placed on avoiding use restrictions of their shade tree resources.

Despite several problems, cooperatives seem to be the best option to work on conservation and development issues. A key part of these efforts should be to contribute to resolve some of the challenges faced by the cooperatives.

## PART II - INSTITUTIONAL VISION: CHALLENGES TO BUILDING POLICY

### Public Goods on Private Lands: the Relevance of Property Rights Institutions to Policy Design

***Derek Kauneckis, Department of Political Science, School of Public and Environmental Affairs, and Center for the Study of Population, Institutions, and Environmental Change, Indiana University***

A combination of both politics and efficacy has shifted the emphasis in international environmental policy from command-and-control type regulations, to what have been termed second-generation policy instruments. These rely on incentives and voluntary action to induce behavior rather than sanctions to prohibit certain activities. Among these is the use of direct payments for ecosystem services. While these instruments have proved successful in a number of cases, the extension of such second-generation policy instruments from their use in the case of individual private property to the wide variety of property rights arrangements around the globe, presents a number of challenges. This paper examines three specific types of problems stemming from property rights arrangements that are likely to confront the use of direct payments for forest ecosystem services.

The discussion begins with the framework provided by Schlager and Ostrom (1992) for understanding property rights as a bundle of rights determining access to a resource, withdrawal, management responsibilities, exclusion rights, and alienation. Looking at property as a bundle of rights rather than reducing it to simply private, common, or public allows focusing on the specific types of problems direct payments are likely to face when used in the very diverse property rights arrangements associated with forest resources.

The paper identifies three key issues that the varieties of property rights institutions create for the use of direct service payments. First, it discusses the underlying difficulty of disaggregating the public and private benefits that a forest ecosystem provides. Second, property rights institutions that vest rights to a group, rather than a single individual, face the additional problem of overcoming collective action dilemmas in providing an environmental service. Third, even when the benefit of a service can be matched to a payment amount, there is a contracting dilemma in ensuring that those environmental services are indeed provided. This includes both the costs of monitoring the provision of the service and in ensuring the appropriate activities are completed.

These three challenges that property rights diversity create for using direct service payments as a policy instrument are illustrated using fieldwork from individual private property in the State of Indiana, the highly regulated land use among private land owners in the Lake Tahoe watershed in California and Nevada, and communal ejido land in the Southern Mexican state of Campeche. Examining the challenges across three different property rights situations (private unregulated, private regulated and communal) illustrates both the problems and potential of expanding the use of direct payments for forest ecosystem services.

### Equity, Institutional Fit and Social Capital: Arguing the Case for a Social Ethic in the New Global Bio-Carbon Market

***Emily Boyd, University of East Anglia***

The paper addresses issues of equity and institutional "fit" between community forest owners, carbon sequestration and conservation. Using a case of one of the world's largest carbon sequestration pilot projects, the Noel Kempff Climate Action Project (NKMCAP) in Bolivia, the author argues that the scheme's initial concern to protect and enhance the forest's physical property by converting natural capital into financial capital for trading in a global carbon market manifests a) issues of misfit between global priorities (what) and local governance (who decides); b) the unrecognised importance of social capital (trust, cooperation, reciprocity); and c) the impacts of "top-down" approach particularly associated with conventional development intervention. Taking a multi- level approach the research frames barriers to project success, outcomes and conflicts. It sets these within the wider institutional arrangements over carbon and the potential "misfit" of property rights and development concepts manifested across levels of decision-making. The paper draws primarily from interviews with project stakeholders, communities, and government officials, and a participatory evaluation workshop in 2001. The author urges for a model of environmental services that is sensitive to principals of "local reality" including equity, local governance and social capital.

### Conservation Incentive Agreements: A Direct Approach to Valuing and Marketing Forest Function in the Tropics

***Richard Rice, Center for Applied Biodiversity Science, Conservation International***

Conservation of biodiversity-rich habitats presents a challenge to nations wishing to develop their natural resources for economic ends. Logging, mining and other resource-development activities offer the prospect of tangible economic benefits but are often environmentally destructive. Although sustainable resource management seeks to provide these benefits while conserving natural ecosystems, experience suggests that a number of obstacles limit both the adoption of sustainable practices and their usefulness in conservation strategies.

To address this problem, the Center for Applied Biodiversity Science at Conservation International (CI) has been working to develop the concept of a conservation incentive agreement, a novel approach that seeks to directly reconcile resource protection with development. Under a conservation incentive agreement, national authorities or local resource users agree to protect natural ecosystems in exchange for a steady stream of structured compensation from conservationists or other investors. Conservation incentive agreements thus present an alternative opportunity for countries to capitalize on vast tracks of forest or other areas of high conservation value.

Such agreements also provide a direct approach to valuing and marketing the environmental services of critical habitats.

In my presentation I will describe the structure of a typical conservation incentive agreement and our experience to date in designing and implementing such agreements in a variety of different contexts around the world.

KEYNOTE ADDRESS

### Implementing Systems of Payments for Environmental Services: Initial Lessons of Experience

***Stefano Pagiola, Environment Department, World Bank***

Tropical forests provide a wide range of valuable services, including hydrological services, biodiversity conservation, and carbon sequestration. These services are often lost, however, because forest land users generally receive no compensation for providing them and so ignore them in their land use decisions. Systems of payments for environmental services (PES) provide a promising solution to this problem, which has been the subject of considerable interest in recent years. Moving from theory to practice is far from easy, however. The World Bank has been working with several of its member countries to develop ways to market the environmental services of tropical forests. Projects based on this approach are being implemented in Costa Rica, Colombia, and Nicaragua, and others are in preparation in Mexico, El Salvador, Ecuador, Venezuela, and the Dominican Republic. These projects focus particularly on marketing the hydrological functions of tropical forests, but also include efforts to market biodiversity conservation and carbon sequestration functions. From this experience, some initial lessons are emerging about the major building blocks necessary for successful PES systems. The first is that the specific services provided by a given tropical forest must be clearly identified and quantified. These depend not only on the characteristics of the forest itself, but more importantly on the characteristics of the users. Hydropower producers, for example, do not use water in the same way as municipal water supply systems. Clearly establishing the link between forests and the users of their services is a major hurdle in marketing these services. Second, mechanisms need to be put in place to collect payments from beneficiaries and use the proceeds to compensate the land users who provide these services. While considerable attention has been devoted to collecting payments from beneficiaries, relatively little has been paid to making them to providers - yet using payments to change the behavior of forest land users is far from straightforward, with considerable potential for creating perverse incentives. The initial experience from PES schemes, as well as the lessons from other related interventions such as reforestation and soil conservation programs, provides several clear principles that payment systems need to follow, including making payments on-going rather than finite and targeting payments by land use and by location. Finally, PES schemes entail numerous political economy issues, perhaps the most important of which is ensuring that the poor can participate and benefit from them. Involving large numbers of small landholders is often difficult because of the high transaction costs involved.

## PART III - GROUNDTRUTHING: PUTTING A FACE ON THE FOREST

### Payment for Ecosystems Services and the Role of Communities in the Americas: Some Lessons for Equity

***Leopoldo Dimas, PRISMA Salvadoran Research Program on Environment & Development***

In the last ten years, debate related to the forest ecosystem services issue has focused on: the development of cost-efficient mechanisms for its sustainable provision, estimation of ecosystem services economic value, development and implementation of ecosystem services markets both at the international and national level, the quantification of the ecosystem service flow, etc. Nevertheless, although these important and considerable efforts have enriched the discussion and research on the forest ecosystem services, surprisingly little information and research exists on the effects that payment for ecosystem services (PES) schemes poses to poor rural communities, despite the key role they playas ecosystem services providers.

This paper attempts to address this void through the revision of experiences related to the implementation of PES schemes in the Americas -specifically Brazil, Mexico, El Salvador, Costa Rica and New York State. This paper presents key lessons for the performance of PES mechanisms that seek to improve poor rural communities livelihoods while providing ecosystems services. Moreover, these lessons provide the underpinnings for a new approach to mechanisms for marketing key ecosystem services that simultaneously improve the socioeconomic development of rural communities.

The key lessons learned are:

§ The use of economic instruments for ecosystem services marketing and its economic valuation are important. But, if the rules for the application of the instrument or for the participation in the markets do not favor poor rural communities, they can be excluded from the benefits and greater inequities will be the end result.

§ The expansion, defense and innovation of poor communities' rights of access, usufruct and control of natural resources are determinant. Expansion of rights can improve the supply of environmental services and the possibility of recognizing the role of small farmers in the provision of environmental services.

§ Look beyond the forest: A landscape perspective to environmental services can contribute to more inclusive and integral schemes. For instance, small shaded coffee farms can have higher complexity and greater potential to supply environmental services, than large-scale monocultures, including single species plantation forests.

§ Supporting social capital accumulation is important to ensure landscape management schemes that guarantee environmental services continuity, as well as the establishment of payment schemes that benefit the rural poor.

§ PES schemes are not a panacea, but they are excellent entry points for revalorizing rural areas and communities.

The lessons learned point to issues that, unfortunately, are rarely raised in association with PES. However these issues - rights of access, use and control of resources; application rules of economic instruments and economic valuation of ecosystem services; social capital formation and accumulation; and a landscape perspective -merit special attention as they are determining factors for developing "equitable" instruments for marketing ecosystems services that reward rural communities for the stewardship of their resources base, and thereby contribute to enhancing their livelihoods.

### Compensating the Philippine Upland Poor for Forest Ecosystem Services: Developing Menus of Tools and Strategies

***Marian S. Delos Angeles, World Agroforestry Centre (ICRAF), Southeast Asia Regional Programme***

Recent experience on the development of markets for environmental services shows various entry points including schemes for recovering the full cost of enhancing supply and using economic instruments for managing demand. The paper reviews the Philippine experience and explores future directions by starting with a summary of the gains and gaps in using resource accounting to support policy reforms that fully cost environmental goods and services from forest ecosystems. These reforms included user and development fees for ecotourism, hydropower generation, and aquaculture in mangrove areas. Subsequent steps are discussed for building on these efforts towards: (a) compensating target, disadvantaged groups such as the upland poor and indigenous communities who practice conservation technologies, and (b) harmonizing ongoing programs to delineate the final forest line, enhance community-based forest management, protect rehabilitated watersheds and address poverty. Issues such as decentralized management of public goods, who underwrites transactions costs, and (un)bundling of payments are raised and arguments for increasing flexibility of tools and strategies are offered.

### The Social Impacts of the Payment for Environmental Services (PES) Scheme in Costa Rica: A Quantitative Field Survey and Analysis of the Virilla Watershed

***Miriam Miranda, Centro Internacional de Política Económica para el Desarrollo Sostenible de la Universidad Nacional de Costa Rica (CINPE-UNA) and the International Institute for Environment and Development (IIED) London***

The PES can be described as the result of a process of institutional capacity building initiated decades ago in Costa Rica. A series of factors within the country enabled the establishment of an institutional framework, with a solid legal, organisational and social base, which facilitated the innovative implementation of the PES.

Although the PES is not a social welfare programme, from the outset the State and various social organisations assumed that it would contribute to rural poverty alleviation in Costa Rica. In political terms the PES could be considered as an innovative instrument to diversify economic activities in rural areas. It became apparent that the programme contributed to improving in quality of life of communities and individuals. Through the new legislation, particularly the Forestry Law (article 46), the National Fund for Forest Finance (FONAFIFO) was created to promote forest development in Costa Rica by financing small and medium producers.

This study attempts to show the social effects of this innovative programme from a holistic perspective, using the Sustainable Livelihoods Framework as a basis for the analysis, and examining the effects the programme has on financial, human, social, physical and environmental capital. The result is an objective analysis of the social effects of the PES in the Central Volcanic Mountain Range Conservation Area (ACCVC). It is important to bear in mind that, given the specific characteristics of this region, care must be taken in the way these results are used to define the rest of the country. Nevertheless, it provides valuable experience relating to conservation areas located on land close to significant population centres and where opportunity cost is high.

The Upper Part of the Río Virilla Watershed (PACV) and the Upper Part of the Río Segundo Watershed (PACS) are both sub-watersheds whose characteristics are significant for this study: i) the PES programme was initiated several years ago in the PACV, while the programme is just starting in the PACS; ii) they are both vital water sources for a number of communities; and iii) several institutions have created programmes for recuperation, conservation y maintenance of these subwatersheds, thus enabling valuable information to be gathered for this study.

In the case of the PACV the analysis is based on the area under the Environmental Improvement Project for the Upper Part of the Río Virilla Watershed (PLAMA VIRILLA), which the National Power and Light Company (CNFL) has been developing, and for the PACS the analysis will be based on information generated from the Recuperation Project for the Upper Part of the Río Segundo Watershed (of the National University of Costa Rica's School of Biological Sciences.

## PART IV - THE DOLLARS AND SENSE OF ECOSYSTEM SERVICES

### Bringing Forest Ecosystem Services into the National Economic Accounts: An Environmental Accounting Approach

***Glenn-Marie Lange, Research Associate Professor, Institute for Economic Analysis, New York University***

Deforestation is a serious problem with both local and global consequences. Yet sustainable forestry has often failed, in part, because of a lack of information about the multiple economic contributions of forests, how forest goods and services are linked to the rest of the economy, and who benefits from them. While there is information about the economic value of commercial timber, many other contributions of forests-such as tourism, biodiversity and ecosystem protection services-are usually missing from the national accounts, our primary source of information about the economy. This lack of information distorts policy analysis, but perhaps more importantly, it hampers the development of institutional alliances to promote sustainable forestry among stakeholders in different sectors because stakeholders are not fully aware of how much they depend on forest services.

Environmental accounts, formalised in the United Nation's System of Integrated Environmental and Economic Accounting (SEEA; UN, 2003), are widely recognized as providing this information. The SEEA is an extension of the System of National Accounts, the primary source of economic data in every country. It puts accounts for the total economic value of forest resources within the larger context of the accounts for the national (or regional) economy. Thus, the SEEA forestry accounts provide a tool for quantitative analysis of the total economic value of forests, as well as a framework for linking information about forestry to the use of other resources and to the broader economy, integrating forestry policy with national development, macroeconomic and sectoral policies.

Sustainable development requires addressing forestry policy in a cross-sectoral context, which can be achieved only when there is a clear incentive to build an alliance among stakeholders in different sectors. A powerful incentive for building such alliances is the information that the SEEA forest accounts provide about the economic benefits of forest ecosystems to non-forestry sectors, including rural development agencies, agriculture, fisheries, tourism, municipal water supply, and others. Potential stakeholders include government, business and civil organizations, as well as private citizens.

This paper describes the implementation of SEEA forestry accounts in South African and Swaziland with examples from other countries to demonstrate how this framework can integrate non-market forest goods and services with other economic information, contributing to better sectoral and macroeconomic policy-making by governments, more effective cross-sectoral alliances, and ultimately, to more effective forest conservation.

### The Identification, Inclusion and Assessment of Constraining Ecosystem Services in the Valuation of Tropical Woodlands

***Andrea Lee, University of Stellenbosch Faculty of Forestry***

### The Business of Certified Sustainable Tropical Timber Harvesting is Tough Enough: The Rest is Still Only Theory…

***John M. Forgach, CEO, A2R Fundos Ambientais Ltda***

One hectare of untouched pristine old growth Amazon Forest in Brazil costs today under US$ 30. It seems like a bargain compared to about US$ 300-600 per hectare of bare agricultural land in the same Amazon Region.

From an academic, biologist's, environmentalist and visionary (romantic?) point of view the old growth forest is indeed a bargain at this price, whereas from a banker, entrepreneur and or private equity investor's stand point it is more likely to be seen as a "dog" (i.e. a losing proposition).

In neighboring Bolívia, the FSC Certified Tropical Forest Concessions offered at U$ 1.00 per ha per year found few bidders. The few done deals are abandoned or bankrupt. In Peru, the government is unable to attract forestry investors despite the friendliest concession conditions in Latin America. Colombia, Ecuador and oil rich Venezuela haven't even started looking at their forestry wealth because they cannot quantify this wealth as easily as traditional commodities.

Low priorities on tropical government agendas, abandoned by regulators and avoided by investors, tropical forest are being hacked down and replaced by bare land, pastures and short term subsistence crops without concern for their importance. The deforestation rates might vary but the trend is consistent.

Certified low impact harvesting methods are certainly bringing new investors into the forest management business but they remain controversial and offer only temporary and limited relief to forest conservation. The other forest related goods and services remain obscure and unquantifiable to investors who shy away from them as markets still ignore the concepts of forest related goods and services. Yet there is no other option to sustainable development and job creation in the jungles of the Brazilian Amazon.

Courageous and committed pioneering investors from Switzerland and the US have started to feel their way into the sustainable harvesting of old growth Amazon Forests. Precious Woods and Gethal Amazonas are the two first FSC Certified Forest management VCs in the Amazon. The first (PW) is only 10 years old. They have barely succeeded in mastering the timber component of the business and are only now starting to produce positive operational cash-flows. In order to preserve shareholder interest they will focus on the timber business before venturing into other pioneering fields. So it will still be a long time before they are able to explore the other goods and services from their forests. Timber is an old and proven business, Biodiversity is not.

Furthermore we are referring to only two out of about 3.000 saw mills operating in the Brazilian Amazon. There are only 4 FSC Certified mills operating in the Region and most are barely making a profit out of timber operations. They are the more advanced operators and bring some hope that things can get better in this business but they are far from capable of looking realistically at incorporating the other values of the forest into their business plans. The remaining 99 % + of the operators are at best incapable at looking at these issues and usually unwilling to be "bothered" as markets fail to incorporate the values associated to biodiversity goods and services.

In theory at least, there are five basic categories of goods and services that can be explored in a tropical forest:

A) Extractive resources (timber and non timber products), which can be further divided into a range of sub-categories that start at the molecular level (biodiversity applications in pharma, biochemicals and cosmetics), pass through leafs, herbs, roots and flowers, fruits, nuts, seeds, fibers and barks, insects, fungi, lower and upper fauna, birds, fish, shells and culminate with other high impact products that include water, soil, sands, minerals and timber. These products are or can be traded and have some commercial value. There is a limited potential in exploring these products.
B) Non-extractive resources are those that have a recognized genetic value to the sustainability of the Earth's ecosystem and its inhabitants (including homo sapiens).
C) Marketable uses such as watershed and climate change, soil conservation, leisure, research, etc.
D) Mystery values, which are often of an intangible nature (at least today) but can become material in the future: the simple -emotional- pleasure , i.e. comfort of having a wild uninhabited forest stand is of immeasurable spiritual, biological and emotional value to human beings. I like to consider it the biodynamics of the forest. It is great to know that we will be able to explore a forest (or enjoy it!) in the future, when will perhaps know more about its mysterious influences on humans.
E) Rental, conservation easements and preservation values: Conservation Institutes and Foundations are today paying to conserve natural forests intact. These values can be explored further and expanded to include sustainable access to goods and services.

While the list of known goods and services provided by Tropical forest ecosystems is quite extensive, markets have not yet been able to explore them in a sustainable manner.

Among the most common reasons, we can list:

1) Forest goods and services are still perceived as public goods and therefore out of the business scope of private enterprise. Yet the public sectors places generally low priorities on forest services, which are offer low visibility and therefore generate few votes….
2) Lack of consumer recognition coupled with lack of government regulations (one usually causes the other) slows the development of markets for Biodiversity products.
3) The commercial success derived from the exploration of certain NTFPs might in fact (i) destroy their native sustainability and (ii) accelerate alternative cultivation techniques, which will ultimately produce better, cheaper and more homogenous products, which will displace the original extractivist product from the market.
4) Funding agents and Development Banks will still see the preservation of a forest stand as an obstacle to development, providing few jobs compared to agriculture, and limiting substantially the alternative uses of the land. Typically Brazilian Banks will not accept untouched old growth forest hectares as collateral to land development projects. The land has value only if deforested.
5) Medium to Long term investor capital requires immediate cash-flow generation at rates which are not compatible with the organic growth of natural forests (currently 12% compared to 1-3% p.a.). Furthermore it does not provide for the initial "grace period" required in sustainable forestry until all pre-operating steps are completed and the business starts producing positive cash flow. These periods can last from 5 to 8 years in the Amazon.
6) Lack of qualified management. The management requirements to operate an FSC Certified forestry operation in the Amazon are overwhelming. They involve extensive knowledge of forestry and sawmill operations, constant technical updating of mill operations, government regulatory frameworks, community politics, labor issues and social development, capacity building, marketing information, biodiversity, Environment, finance, fiscal and shareholder interests, etc. It is a real challenge and few are equipped to face it. Without proper management investors will not risk their money.
7) Sovereignty and demagogy: "The Amazon is ours!" cry the Brazilians, yet judging from the relatively small amounts they have invested in the forest, it seems that foreigners are paying much more attention to the Amazon. This reality scares foreign investors, who would like to see Brazilian capital investing alongside offshore funds.

There are several more issues at stake involving indigenous rights, regulated access to Biodiversity, dividends to forest dwellers, potential liabilities and compensation for damages from exploration of goods and services, etc. The subject is broad and intimidating. It seems that each time we remove an obstacle to the sustainable use of the forest, a dozen new ones appear before us. Serious investors are mapping the road and advancing with reasonable caution. But we cannot move too slow either as there might not be any old growth forests to explore once we have resolved all the problems of marketing their goods and services…?

CLOSING ADDRESS

### Ecosystem Services: What is their Value and What Will you be Paid?

***Robert Mendelsohn, Edwin W. Davis Professor of Forest Policy, Professor of Economics, Yale School of Forestry & Environmental Studies, Professor, Yale School of Management***

This paper will present an economic framework that can be used to determine the value of ecosystem services. Ecosystem services have value because they provide something that society wants. However, even though most ecosystem services have value, it is not always possible to obtain revenue for providing them. Ecosystem services that lead to the provision of private goods, goods readily bought and sold, will yield revenue returns and so can directly reward individuals engaged in conservation. However, many ecosystem services support public goods, jointly consumed goods, which cannot be easily marketed and so produce little revenue. The long run challenge for conservation is to find institutional arrangements that can generate revenue for these public goods. The recent development of the Global Environment Facility is an excellent example of such an institution.