



John D. Rockefeller 3rd
Scholars Program



PAYMENTS FOR ENVIRONMENTAL SERVICES



Annotated Bibliography
March 2005

Executive Summary

The John D. Rockefeller 3rd Scholars Program is a new initiative created by the Winrock International Board of Directors to further the Rockefeller family's commitment to support promising Asian scholars. The Program will commission multi-country teams of mid-career researchers in sustainable agriculture and natural resource management in order to pursue the following goals:

- Build the capacity and leadership skills of Asian researchers to solve development problems through innovative, regional collaboration, and
- Foster problem-focused, multidisciplinary research that will result in actionable plans and policies to sustain and restore rural ecosystems.

The first team commissioned by the Program will investigate payments for environmental services to benefit the rural poor and contribute to ecosystem conservation.

Many upland and mountain communities manage landscapes in ways that benefit lowland and downstream communities and cities, but most do not receive any benefits from the services they provide. These *environmental services* include clean and abundant water supplies from watersheds, erosion control, timber and non-timber forest products, biodiversity protection, recreational areas, culturally important landscapes, and carbon sequestration for alleviation of climate change. *Payments for environmental services* (PES) can compensate natural resource stewards for the services they provide while aligning incentives for local communities, investors and other stakeholders. Interest in PES schemes and their potential to alleviate poverty is growing among international development and conservation organizations as well as multi- and bi-lateral funding agencies.

The annotated bibliography presented here surveys publications that may be useful resource materials for those interested payments for environmental services, and in particular water resource valuation for conservation. Most documents are accessible by clicking on their title, or a web address is given.

Cover photo credits, clockwise from top left: Winrock International; Roberto Faiduth of the Food and Agriculture Organization; Roberto Faiduth.

Alix-Garcia, J., de Janvry, A., and Sadoulet, E. (2004). *Payments for Environmental Services: To whom, for what, and how much?* Draft. University of California, Berkeley.

A study analyzes the most cost effective and efficient payment schemes for use in combating deforestation in Mexican common property forests. The proposed payment scheme is a national incentive plan funded by federal taxes. In comparison to the proposed plan, two other policies would be less expensive to implement and could be used to supplement the national plan: policy adjustments and markets for environmental services, both at the local and international level. Three options for the design of the national PES system are simulated. The three designs are compared for effectiveness and beneficiaries. The scheme which paid a flat rate under a cap on the amount of acreage was the most equitable of the three but also the least efficient. The other two schemes targeted specific forest areas and based the amount of the payment either on opportunity costs or environmental benefits. The highest efficiency occurred using the plan based on environmental benefits.

Arocena-Francisco, H. (2003). *Environmental service “payments”: Experiences, constraints, and potential in the Philippines*. Indonesia: World Agroforestry Centre (ICRAF). Available from the World Agroforestry website: www.worldagroforestry.org/sea/networks/rupes/download/CD_WProceed/Regional_Workshop_6_8_Feb_02/hermi.pdf

Case studies of four areas in the Philippines - a watershed, forest reserve, and two protected area national parks – document past methods for providing payments to local communities for environmental services, funding sources, and payment administration. In addition to cash, payments for environmental services are defined as goods, training, technical assistance, and land tenure rights. The goal of past projects has been using payments or incentives for poverty alleviation and not primarily for the provision of environmental services. Based on the case studies and past project performances, an essential element which should be considered in designing a reward system for upland communities for watershed conservation is directly linking the payment or incentive to the provision of environmental services both for the seller of the services, the upland communities, and the consumers of the services. Other elements which should be included in designing a reward system include defining the environmental services to be provided, determining who is paid and the amount of the payment, the actions or results necessary to earn payment, and payment administration. Additional funding from outside sources would be required for carbon and biodiversity services.

Aylward, B. and Tognetti, S. (2002). *Valuation of hydrological externalities of land use change: Lake Arenal case study, Costa Rica*. Land-water linkages in rural watersheds, Case study series. Rome: Food and Agriculture Organization of the United Nations. Available from the FAO website: www.rlc.fao.org/foro/psa/pdf/hydrolo.pdf

A case study in the Lake Arenal area in Costa Rica found that livestock and dairy production produced higher income than water service payments. Neither market nor government incentive payments provided enough income for ranchers to reforest steep slopes used for cattle ranching and agriculture. A related study did find that small landowners would be more inclined to accept the incentives.

Babcock, B.A., Beghin, J., Duffy, Michael, Feng, H., Hueth, B., Kling, C.L., Kurkalova, L., Schneider, U., Secchi, S., Weninger, Q., and Zhao, J. (2001). *Conservation payments: Challenges in design and implementation*. Briefing paper, 01-BP 34. Ames, IA. : Center for Agricultural and Rural Development and Iowa State University, Department of Economics. Available from the Iowa State website:

www.econ.iastate.edu/research/webpapers/paper_1993.pdf

In the past, the goal of the U.S. farm program has been income support for the farmer. Changing the objective of the farm payment program to environmental conservation would provide a clear justification for the program for taxpayers while still providing income support to farmers. Conservation programs can produce gains in economic efficiency by increasing environmental services while maintaining low transaction costs for the conservation service. Conservation payments can be administered as voluntary programs which pay farmers for conservation activities or as penalties imposed on farmers who do not follow prescribed activities; voluntary payments are preferable since the payments would provide farm income. Lessons learned from past conservation programs show that payments should be based on benefit-to-cost ratio to improve efficiency in providing the environmental services; that a monitoring system must be in place; and that environmentally sound productive uses of land are less costly than set-aside programs.

Barton, D.N., Faith, D., Rusch, G., Gjershaug, J.L., Castro, M., Vega, M., and Vega, E. (2003). *Spatial prioritization of environmental service payments for biodiversity protection: Decision-making models for evaluating cost-effectiveness of conservation priorities using alternative biodiversity indicators*. Report SNR 4746/2003. Oslo: Norwegian Institute for Water Research. Available from the Institute website:

www.inbio.ac.cr/ecomapas/bioindicadores/paginas_es/Bioindicadores.pdf

An analysis of the payments for environmental services program for private land surrounding the Osa Conservation Area (ACOSA) in Costa Rica found that the program was not cost-efficient based on biodiversity gains and opportunity costs for agriculture and commercial forestry. The study demonstrated the use of GIS software to rank the size and location of areas based on cost-effectiveness in increasing biodiversity conservation.

Bayon, R. (2004). *Making environmental markets work: Lessons from early experience with sulfur, carbon, wetlands, and other related markets*. Prepared for the Katoomba Group Meeting in Locarno, Switzerland, Fall 2003. Washington, D.C.: Forest

Trends. Available from the Iowa State University website: www.forest-trends.org/resources/pdf/Environmental%20Markets_R%20Bayon_final.pdf

An examination of the markets created for wetland mitigation credits, carbon and other environmental services shows that markets are useful and effective tools for environmental conservation. The continuing and effective operation of these markets requires government intervention for a strong legal and regulatory framework and for the establishment of property rights for services that previously were considered public goods. An equitable payment scheme would distribute property rights and payments to all traditional holders rather than allocating payments to the government.

Bayon, R., Lovink, J.S., Veening, W.J. (2000). *Financing biodiversity conservation*. Washington, D.C. : Inter-American Development Bank. Available from the IADB website: www.iadb.org/sds/env/publication/publication_200_1887_e.htm

The difficulty in obtaining financing for biodiversity conservation lies in the “public goods” nature of biodiversity services and the lack of mechanisms to “internalize” the services through markets. This report provides an overview of existing and experimental financing mechanisms for biodiversity. The mechanisms are divided into three categories based on the sources of the funds used for financing: protection of biodiversity as a public good, correction of negative externalities, and support for biodiversity businesses. Tradable permits, user fees and charges and carbon sequestration all are discussed as part of the correction of negative externalities category.

Binning, C., Baker, B., Meharg, S., Cork, S., and Kearns, A. (2002). *Making farm forestry pay - markets for ecosystem services*. Canberra, Australia: Rural Industries Research and Development Corporation. Available from the RIRDC website: www.rirdc.gov.au/reports/AFT/02-005.pdf

Markets for environmental services are not the only solution for Australia’s environmental problems. Potentially, however, MES can provide a means to fight environmental degradation and supplement farm forestry product income.

Bui, D. T., Dang, T.H. Thus, D.N., & Nguyen, Q.C. (2004). *Rewarding upland farmers for environmental services: Experiences, constraints, and potential in Vietnam*. Indonesia: World Agroforestry Centre (ICRAF). Available from the ICRAF website: www.worldagroforestry.org/sea/Networks/RUPES/download/paper/Study_The_et_al.pdf

A study of SIDA and International Fund for Agriculture Development (IFAD) rural development projects in Vietnam reviews environmental, cultural, and economic conditions in northern Vietnam for use in guiding the possible design and implementation of a Rewarding Upland Farmers for Environmental Services (RUPES) project in Vietnam. Findings of the study concluded that project designs should be site-specific to address the wide diversity of physical, economic, and

social characteristics. Environmental goals for projects can include both environmental restoration to reverse degradation and environmental conservation. If the goal of the project is poverty alleviation, then the project should target the lowest economic group of farmers; if the project goal is environmental services provided at the least cost, then the project should target a higher-level income group of farmers.

Carret, J.C. & Loyer, D. (2003). *Madagascar Protected Area Network Sustainable Financing: Economic Analysis Perspective*. Washington, DC: World Bank.

Madagascar, in the past ten years, has invested in protected areas for prevention of deforestation and for biodiversity conservation but the conservation efforts need sources of sustainable financing. An analysis of available options for securing financing concludes that PES is not a feasible option in Madagascar because it would not be easy to identify the providers of the environmental services who should receive payment, the transaction costs would be too high, and the beneficiaries of the environmental services in Madagascar would not have the financial resources to pay for the services..

CCICED Western China Forest Grasslands Task Force. (2002). *Workshop on payment schemes for environmental services: Summary of proceedings, April 22 – 23, 2002, Beijing*. Available from the Forest Trends website: http://www.forest-trends.org/keytrends/pdf/Taskforce%20pdfs/payments%20wrkshp_proceedings.pdf

A 2002 workshop in China on payments for environmental services compiled information on payments for environmental services through presentations of experiences from project in the United States, Brazil, and Costa Rica. The goal of the workshop was guidance for officials in designing environmental services financing for China.

Chomitz, K.M., Brenes, E., & Constantino, L. (1998). *Financing environmental services: the Costa Rican experience and its implications*. Washington, DC: Environmentally and Socially Sustainable Development, Latin America and Caribbean Region, World Bank. Available from the World Bank website: [http://lnweb18.worldbank.org/ESSD/envext.nsf/44ByDocName/FinancingEnvironmentalServicesTheCostaRicanExperienceandItsImplications1998210KPDF/\\$FILE/FinancingEnvironmentalServicesTheCostaRicanExperienceandItsImplications1998.pdf](http://lnweb18.worldbank.org/ESSD/envext.nsf/44ByDocName/FinancingEnvironmentalServicesTheCostaRicanExperienceandItsImplications1998210KPDF/$FILE/FinancingEnvironmentalServicesTheCostaRicanExperienceandItsImplications1998.pdf)

Costa Rica has established a program for compensating landowners for forest management, preservation and reforestation. Payments to private landowners are administered through government agencies based on a fixed price schedule and not on varying environmental values for a specific area. Payments are also bundled to smaller landowners through NGOs such as FUNDECOR, furnishing access to the program for smaller landowners and reducing overall transaction costs. Transaction costs include preparation of a landowner management plan and compliance monitoring by government foresters. The major funding source is a

fuel tax with potential funding through carbon offset sales. Suggested adjustments to the plan are varying payment levels based on prioritization of conservation goals and the value of the natural resource following the example of the US Conservation Reserve Program. Another suggested adjustment is retaining a portion of taxes and carbon offset funds to fund biodiversity conservation and poverty alleviation or other social goals.

Daily, G. and Ellison, K. (2002). *The New economy of nature*. Washington, D.C.: Island Press.

The New Economy of Nature features stories about the creators and pioneers of new approaches to the conservation of natural resources. Studies ranging from New York City's investment in upstate watershed services to the establishment of a bee refuge illustrate the feasibility and possibility for establishing trading systems for environmental services to make conservation profitable.

Echavarría, M., Vogel, J., Alban, M. & Meneses, F. (2004). *The Impacts of payments for watershed services in Ecuador: Emerging lessons from Pimampiro and Cuenca*. Markets for Environmental Services, no.4. London: International Institute for Environment and Development. Available from the IIED website:
www.iied.org/docs/eep/MES%20Series/MES4EcuadorWatersheds.pdf

Case studies of two towns in Ecuador implementing payments for watershed services detail steps necessary in operating markets for water services. The study points out the need for scientific research and data to document the link between watershed protection and the provision of water for equitable valuation of watershed services. Current market participants are municipal water systems and hydroelectric plants; the agricultural uses of water, particularly irrigation, have not been considered. A survey of participants in local communities found that payments for watershed services were used for basic necessities, not implementation of new conservation practices. The study concludes that markets for environmental services are only part of the overall framework for environmental protection.

FAO Regional Office for Latin America and the Caribbean. (2004). *Payment schemes for environmental services in watersheds*. Proceedings of a Regional Forum, Arequipa, Peru, June 9–12, 2003. Rome, Italy. Land and Water Discussion Paper – 3. Rome: Food and Agriculture Organization of the United Nations. Available from the FAO website:
<ftp://ftp.fao.org/docrep/fao/006/y5305b/y5305b00.pdf>

Based on presentations about payments for environmental services (PES) experiences in Latin America, participants in a regional workshop developed criteria for the valuation of watershed services and listed elements necessary for successful implementation of PES systems. Characteristics of past projects showed that most PES systems use market mechanisms, the geographic scope can range from micro-watershed to national in scope, the majority of programs do not

have a legal framework, a complete inventory of PES systems does not exist nor have environmental or socio-economic impacts been assessed, the primary benefit may have been the establishment of property rights, administrative institutions range from national to local, and PES systems need to be adapted for the specific location. Participants recommended that the project design not cause inequities even if poverty alleviation is not a primary objective, that PES systems should be designed for sustainability, inclusion of agricultural lands should be considered, and monitoring and evaluation should be essential components.

Ferraro, P.J. (2000). *Constructing markets for ecosystem services: Limitations of development Interventions and a role for conservation performance payments*. Presented at Constituting the Commons: Crafting Sustainable Commons in the New Millennium, the Eighth Conference of the International Association for the Study of Common Property, Bloomington, Indiana, USA, May 31-June 4.

Direct payments for environmental services have several advantages over the more prevalent method of indirect payments including exact conservation targets and more rapid results and the inclusion of local residents in conservation goals. In situations and locales where the direct payment system is not feasible or possible, then an indirect payments system also would not be successful.

Ferraro, P.J. & Simpson, R.D. (2000). *The Cost-effectiveness of conservation payments*. Discussion paper 00-3100-31. Washington, DC: Resources for the Future. Available from the RRF website: www.rff.org/Documents/RRF-DP-00-31.pdf

Donor investments in developing countries for ecosystem conservation have been primarily indirect payments. Examples of indirect payments schemes include ecotourism, biodiversity prospecting, and nontimber forest products in which donor funds are used for infrastructure improvements, marketing, and post-harvest processing. Direct payments to the landowners or groups who manage ecosystems would be a more cost-effective approach for forest conservation based on the example of a bee-keeping project in Madagascar in which indirect payments were 12 times more expensive than direct payments for the same amount of forest area. In both instances, income for local landowners increased although profits were higher in the indirect scheme.

Ferraro, Paul J. (2001). Global habitat protection: Limitations of development interventions and a role for conservation performance payments. *Conservation Biology*, 15(4), 990-1000.

A comparison of direct and indirect incentive payment systems for environmental conservation finds that direct payments offer several advantages: payments are targeted for a specific goal, short-term results are possible, the payments provide a clear link between the payment and conservation behavior, local residents have a stake and are no longer adversaries in the conservation effort, ecologically valuable assets are also seen as economically valuable, payments stay within the

region, and there are fewer incentives for immigration. Direct payments are not applicable in all situations and there can be difficulty in implementation in identifying property rights, securing funding sources, and adjusting institutional policies.

Gouyon, A. (2003). *Rewarding the upland poor for environmental services: A review of initiatives from developed countries*. Bogor, Indonesia: World Agroforestry Centre. Available from the ICRAF website: www.worldagroforestrycentre.org/sea/Networks/RUPES/download/paper/

An analysis of environmental services schemes in developed countries provides lessons learned to assist in the development and design of environmental service reward transfers for the rural poor in Asia. Transfer mechanisms, including market and non-market mechanisms are divided into five categories: conservation strategies such as integrated conservation and development projects, contractual arrangements, ecotourism, genetic resource sharing, and trade in emission permits. Each of these mechanisms has been analyzed by several factors: type of environmental service provided, beneficiaries of the transfer, institutions involved, type of rewards, contractual link between the service and the reward, and the monitoring and evaluation system. All of the mechanisms studied required laws, policies and institutional development and funding although market-based systems had a higher potential for providing funding. Removing penalties appeared to be a more effective means of providing poverty alleviation for the upland rural poor than the environmental services reward mechanisms studied.

Grieg-Guan, M. and Bishop, J. (2004). How Can Markets for Ecosystem Services Benefit the Poor? In: D. Roe (Ed.), *The Millennium Development Goals and Conservation - Managing Nature's Wealth for Society's Health*. London: International Institute for Environment and Development.

Markets for ecosystem services (MES) while meeting environmental goals also could provide opportunities for poverty alleviation. In addition to increased income, MES projects can provide clear land titles, formation of community organizations, employment opportunities, and environmental improvements affecting nutrient and health. However, MES projects also carry inherent risks for the poor. Recommendations for payment scheme enhancements in order to improve the participation and income generation for smallholders include removal of restrictions against small land holdings and informal land titles, reduced transaction costs, and improved information and capacity building initiatives.

Gutman, P. (2001). *Forest conservation and the rural poor: A call to broaden the conservation agenda*. Washington, D.C.: World Wide Fund for Nature. Available from the WWF website: www.panda.org/downloads/policy/Forest_and_Poverty.pdf

The current emphasis on poverty alleviation compels an examination of past forest conservation and poverty alleviation projects including market-oriented

reforms, agricultural intensification projects and integrated conservation and development projects (ICDPs). These approaches promised poverty alleviation and forest conservation but have not delivered the expected results for either forest conservation or poverty alleviation. However, based on a study of the causes of forestry deforestation and the rural poor dependence on forestry, future forest conservation policies must include rural poverty alleviation as a key focus. Payment for environmental services will be a key requirement for sustainable environments and livelihoods.

Gutman, P., (Ed.) (2003). *From good-will to payments for environmental services: A survey of financing alternatives for sustainable natural resource management in developing countries*. Washington, DC: WWF; Copenhagen: Danida.
Available from the DANIDA website: www.wwf.dk/db/files/final_survey_31_8_03.doc

Analyses of fifty-two alternative financing mechanisms for sustainable natural resource management projects are evaluated for potential effectiveness in environmental conservation, poverty alleviation, and sustainability. Assessments for each financing mechanism include a discussion of advantages and disadvantages, suitability for differing types of conservation sectors, country case studies, and a list of information resources. The financing mechanisms are limited to those focused on financing for the rural poor in developing countries. Payments for environmental services are broadly defined to include markets for environmental services and products, some private sector-community partnerships, government-controlled transactions and international agreements.

Hartmann, J., and Petersen, L. (2004). *Marketing environmental services: Lessons learned in German development cooperation*. Presented at "The Commons in an Age of Global Transition: Challenges, Risks and Opportunities," the Tenth Conference of the International Association for the Study of Common Property, Oaxaca, Mexico, August 9-13.

Based on an analysis of German development forest and water projects, a number of factors essential for successful payments for environmental services (PES) can be identified as well as defining the role for development agencies in PES. In comparison to subsidies, PES projects financed by German agencies have focused objectives, specific incentives for landowners, short-term results, and voluntary landowner involvement. Farmers had access to extension services, technical skill training, and in addition, formed cooperative organizations. German-funded technical assistance projects worked with the users of environmental services guiding essential project steps in determining watershed boundaries, identifying owners of property rights, providing cost analyses, planning for financing and facilitating interaction of beneficiaries and landowners. Factors identified as essential for the success of projects include organizational and institutional frameworks, sustainability and cost effectiveness. Institutional requirements include clear land tenure rights, acceptance and understanding of contractual requirements, and payment schemes that match the socio-cultural environment of

the community. Taxpayers and others providing funding for environmental services payments are most interested in environmental outcomes, not social objectives or poverty alleviation goals. Markets should remain as the primary mechanism for obtaining financing for PES.

Herrador, D., and Dimas, L. (2000). Payment for environmental services in El Salvador. *Mountain Research and Development*, 20(4), 306-309.

Much of the crop production in El Salvador occurs on small subsistence farms in mountainous areas with intensive soil use and few conservation practices. Over 80% of soil and water conservation projects have used incentives to encourage the use of soil conservation practices. However, very few new technologies have been adopted by a large number of farms or transferred to adjoining locations. Most new practices are practiced locally only by a few farmers and dropped at the end of the project. PES is being investigated as a more effective alternative practice.

Jenkins, M., Scherr, S. J., and Inbar, M. (2004). Markets for biodiversity services: Potential roles and challenges. *Environment*, 46(6), 32-42.

Financing for biodiversity conservation historically has been the responsibility of the public sector but the decline of public funds available for conservation has led to the need to locate other sources of financing. By capturing the financial value of environmental services from users of the resources, land owners and managers can be compensated for their stewardship. Payments from users to owners are viewed sustainable sources of funding for biodiversity conservation as opposed to donor or public funds.

Johnson, N., White, A., and Perrot-Maître, D. (2001). *Developing markets for water services from forests: Issues and lessons for innovators*. Washington, D.C.: Forest Trends. Available from the Forest Trends website: www.forest-trends.org/resources/pdf/Developing_Markets_for_Water_Services.pdf

An analysis of markets for hydrological services based on nine case studies provides an overview of various payment schemes and their common elements. The type of financing mechanism selected depends on the site, its regulatory framework, the participants, and the specific watershed service. Key questions to be answered in establishing environmental markets are determination of the particular watershed service which provides a specific benefit, a system for measuring the services, definition of rights and responsibilities for maintaining the service, valuation of the services, willingness to pay for the services and transaction costs. Public payment schemes are the most popular and the scheme with the highest financial volume. Private contracts are used in situations involving private goods which can be supplied at lower costs than through more traditional approaches to water supply. Trading schemes need a strong regulatory framework and monitoring. Other observations conclude that participation by all stakeholders in establishing the payment scheme is a necessity and that prices for

watershed services are more often based on policy or budget requirements than economic valuation of the benefit itself. Details of the nine case studies are provided in Perrot-Maître and Davis (2001).

Kanninen, M., Myatt-Hirvonen, O., Salinas, Z., Segura, M., and Berninger, F. (2002). Land use changes and carbon flows in Central America: Options for carbon management. In: Käyhkö, J. and Talve, L, (Eds.) *Understanding the Global System: the Finnish Perspective*. Turku: Finnish Global Research Change Programme (FIGARE), 201-205.

A research project to assess sustainable forest management in Central America documented forest cover, land use, and carbon biomass in varying biophysical, socio-economic and cultural locations. In the village of La Quezada in Nicaragua, where the goal for sustainable forestry management is the prevention of agricultural expansion, a study surveyed farmers, local government officials and other residents. PES has been proposed as the method to pay farmers for continuing land use for storing carbon. The survey found that landowners base land management decisions on a variety of socio-economic, ecological and cultural factors and not solely on a financial basis.

Kerr, S., Lipper, L., Pfaff, A.S.P., Cavatassi, R., Davis, B., Hendy, J., and Sanchez, Arturo. (2004). *Will buying tropical forest carbon benefit the poor? Evidence from Costa Rica*. ESA working paper, no. 04-20. Rome: Agricultural and Economics Development Division, Food and Agriculture Organization of the United Nations.

Carbon sequestration payments potentially provide local income and ecosystem services. However, the policies most efficient for carbon sequestration may not necessarily be the most efficient for poverty alleviation. A study of the carbon market in Costa Rica provides data to show that payments for carbon sequestration can provide income to poor land owners and support conservation. The risk remains that in the future, poorer land owners may be excluded from the carbon market by high transaction costs.

Landell-Mills, N. (2002). *Marketing forest environmental services – who benefits?* Gatekeeper series, no. 104. London: International Institute for Environment and Development. Available from the IIED website: <http://www.iied.org/docs/gatekeep/GK104.pdf>

The promise of environmental protection and economic efficiency has fueled the current trend in the forest sector to adopt market-based instruments rather than command and control systems of incentives. However, several questions about the performance, effects, and sustainability need further research and, in particular, how markets for environmental services will affect the poor. Based on a previous review of 287 cases (Landell-Mills and Davis, 2002), recommendations are presented for the design of market initiatives to increase the equity of MES for the poor: establishment of property rights, training, information centers, and access to finance.

Landell-Mills, N. and Porras, I. (2002). *Silver bullet or fools' gold. A global review of markets for environmental services and their impact on the poor*. London: International Institute for Environment and Development. Available from the IIED website: http://www.iied.org/docs/flu/psf/psf_silvbullet.pdf

Markets for forest environmental services are developing at a fast pace both in the developed and developing world. The study points out the diverse market structures varying by number and type of participants, the payment mechanisms involved, and the degree of maturity. Essential steps for market creation are identification of commodities, assessment of marketing costs, involvement of all affected stakeholders, governance structure, and equity in market access. An analysis of over 280 case studies of actual and planned market services – 72 for biodiversity conservation, 75 for carbon offsets, 61 for watershed protection, 51 for landscape beauty, and 28 for bundled environmental services – illustrates market benefits in generating income for the poor and sustaining the supply of environmental services. However, markets also can have negative aspects for the rural poor. Steps to improve market benefits for the poor include establishment of property rights, identification of commodities to be sold, design of cost-effective payment mechanisms, establishment of cooperatives to share transaction costs, training and education, creation of market support and information centers, and improvement of access to funding.

Mayrand, K. and Paquin, M. (2004). *Payments for environmental services: a survey and assessment of current schemes*. Montreal: Unisfera International Centre for the Commission for Environmental Cooperation of North America. Available from the CEC website: http://www.cec.org/files/PDF/ECONOMY/PES-Unisfera_en.pdf

A recent survey report documents PES schemes from the western hemisphere identifying structures, strengths, and potential for environmental and socioeconomic impact. Over 300 PES schemes are documented but there is not a common definition and agreement which leads to the wide diversity of structures and types of payments discussed. The report also finds that the best choice of financing mechanism is not always a payment for environmental services scheme. Successful PES projects have clearly identified services and beneficiaries, clear property rights and strong legal frameworks and are situated in an area rich in environmental services.

Miranda, M., Porras, I.T. and Moreno, M.L. (2003). *The Social impacts of the payments for environmental services (PES) scheme in Costa Rica: A quantitative field survey and analysis of the Virilla Watershed*. Markets for Environmental Services, no.1. London: International Institute for Environment and Development. Available from the IIED website: www.iied.org/eep/pubs/documents/MES1.pdf

The Payments for Environmental Services (PESP program in Costa Rica pays forest owners for four environmental services: carbon, biodiversity, watershed management, and landscape beauty. Although poverty alleviation is not a goal of

the program, socio-economic impacts have been observed. This study surveyed households in the Central Volcanic Mountain Range Conservation Area (ACCVC) in the Virilla watershed using the Sustainable Livelihoods Framework to assess financial, human, social, physical and environmental assets. The survey found significant impacts on financial assets – a 15% increase in disposable income, investment in forest sectors and agricultural productivity – but the program also had high transaction costs. Social and human impacts were noted in the development of local and community-based organizations and educational and training activities. Negative effects include high entry costs which can prevent access by small farmers and the exclusion of traditional livestock-forest production systems from the PES program.

Miranda, M., Porras, I., Moreno, M.L. (2004). *The social impacts of carbon markets in Costa Rica: a case study of the Huetar Norte region*. Markets for Environmental Services, no. 6. London: International Institute for Environment and Development. Available from the IIED website: www.iied.org/docs/eep/MES%20Series/MES6CostaRicaCarbon.pdf

Based on a Sustainable Livelihoods assessment, the carbon market in Costa Rica has been advantageous in providing both financial and nonfinancial benefits. However, timber sales have been a larger source of income than carbon markets. High transaction costs can prevent access to the carbon market for the rural poor.

Munawir, S., Salim, S., Suyanto, A. and Vermeulen, S. (2003). *Action-learning to develop and test upstream-downstream transactions for watershed protection services: A diagnostic report from Segara River basin, Indonesia*. Jakarta: PSDAL-LP3ES; London: International Institute for Environment and Development. Available from the IIED website: www.iied.org/docs/flu/full_final_inception_report.pdf

A project in the Segara River basin on the island of Lombok in Indonesia funded by the World Bank is studying the use of market-based payment mechanisms to deliver both water services and income to support local livelihoods. Downstream users are concerned about sedimentation and the shortage of water for household use and irrigation. Upstream farmers are concerned with increasing income from agroforestry plantation cash crops and strengthening community land rights. Two commercial firms have voluntarily made agreements for financial contributions to village administration. Favorable conditions exist for the establishment of a more formal payment system, for community group involvement in water management concerns, for changes occurring in national policies favoring community-based forest management, and for the establishment of voluntary payment agreements. However, there are several constraints to the implementation of the water transfer payment scheme. There is not enough data linking watershed management practices with water supply downstream nor for structuring a fair and equitable payment scale for the services. There is also concern that downstream farmers have lower cash incomes than upstream farmers who have income from tree crops.

Nasi, R., Wunder, S., and Campos, J. (2002). *Forest ecosystem services: Can they pay our way out of deforestation*. A discussion paper prepared for the GEF for the Forestry Roundtable to be held in conjunction with the UNFF II, Costa Rica on March 11, 2002. Washington, D.C.: Global Environmental Facility. Available from the GEF site: http://thegef.org/Documents/Forest_Roundtable/Forest_Ecosystem_Service-Deforestation.pdf

Degradation of forest lands and loss of forests occurs, not only as a result of “perverse incentives”, but primarily because deforestation is profitable for local forest owners and managers. To stop deforestation and preserve essential forest ecosystem services, local forests owners and managers need income from forest conservation activities. Economic valuation of the forest ecosystem services can be a useful tool in establishing a price structure but the more important consideration is the determination of how much income is needed at the household level to maintain forest land.

Nelson, K.C. and DeJong, B. H.J. (2003). Making global initiatives local realities: carbon mitigation projects in Chiapas, Mexico. *Global Environmental Change*, 13, 19-30.

A study of Fondo Bioclimatico, a carbon mitigation project in Mexico, illustrates the growth and development of a payments for environmental services project. The project has been successful in obtaining contracts for carbon sales, increasing the number of participating farmers, and strengthening the administration of the project. However, the focus of the project has narrowed from community development to a brokerage arrangement with individual farmers.

Niles, J.O., Brown, S., Pretty, J., Ball, A.S., and Fay, J. (2001). *Potential carbon mitigation and income in developing countries from changes in use and management of agricultural and forest lands*. Centre for Environment and Society occasional paper, 2001-04. Colchester, UK: University of Essex CES. Available from the CES website: <http://www2.essex.ac.uk/ces/ResearchProgrammes/CESOccasionalPapers/OccPaper2001-4.pdf>

An analysis of 48 selected tropical countries in Africa, Asia, and Latin America estimated the potential carbon sequestration and the corresponding income potential generated from carbon markets over a 10-year timeframe. The estimate for carbon sequestration included the calculation of carbon through three approaches: the reforestation of degraded lands, the slowing of deforestation, and the use of sustainable agriculture practices. The largest volume of carbon and the highest potential income resulted from the slowing of deforestation. The countries in Latin America would have the highest potential income from carbon sales followed by the group of countries from Asia. The study pointed out that reforestation, sustainable land management and the slowing of deforestation are all necessary methods for the largest carbon mitigation results but that only reforestation will receive financing under the rules of the Kyoto Protocol.

Developing countries will need alternative financing and new markets for ecosystem services to provide compensation for adoption of sustainable land management and conservation practices and policies.

Pagiola, S. and Platais, G. (2002). *Payments for environmental services*. World Bank Environment Strategy Notes, no 3. Washington DC: Environment Department, World Bank. Available from the World Bank website: [http://lnweb18.worldbank.org/ESSD/envext.nsf/41ByDocName/EnvironmentStrategyNoteNo3PaymentsforEnvironmentalServicesInEnglish/\\$FILE/EnvStrategyNote32002.pdf](http://lnweb18.worldbank.org/ESSD/envext.nsf/41ByDocName/EnvironmentStrategyNoteNo3PaymentsforEnvironmentalServicesInEnglish/$FILE/EnvStrategyNote32002.pdf)

Payments for environmental services (PES) are defined as payments from the users of environmental services directly to the providers of environmental services. A sustainable PES scheme needs to avoid perverse incentives, have a long-term financing schedule, and focus on specific services and target areas. PES potentially could contribute to poverty alleviation goals and fit within the World Bank environmental strategy objectives.

Pagiola, S., Agostini, P., Govvi, J., Haan, C. de, Ibrahim, M., Murgueitio, E., Ramirez, E., Rosales, M., Pablo Ruiz, J. (2004). *Paying for biodiversity conservation services in agricultural landscapes*. Environment department paper, no. 96. Washington, D.C.: Environment Department, World Bank. Available from the World Bank website: [http://lnweb18.worldbank.org/ESSD/envext.nsf/44ByDocName/PayingforBiodiversityConservationServicesinAgriculturalLandscapes/\\$FILE/PayingforBiodiversityConservationServicesinAgriculturalLandscapes.pdf](http://lnweb18.worldbank.org/ESSD/envext.nsf/44ByDocName/PayingforBiodiversityConservationServicesinAgriculturalLandscapes/$FILE/PayingforBiodiversityConservationServicesinAgriculturalLandscapes.pdf)

The Regional Integrated Silvopastoral Ecosystem Management Program, a GEF-funded project, tested a direct payment financing scheme for the provision of biodiversity conservation and carbon sequestration in watersheds in Colombia. Silvopastoral systems can provide benefits both for increased agricultural productivity (pasture productivity, tree products, livestock production, diversification of income) and biodiversity conservation (species diversity, increased wildlife population, biological corridors, and carbon sequestration). However, farmers can be reluctant to adopt silvopastoral practices due to high initial costs and lack of information about the benefits. The payment scheme for the RISEMP project was designed to encourage sustainability and to avoid perverse incentives and leakages. Farmers receive an up-front payment plus annual payments for two-to-four year periods. An extensive monitoring system is in place to document changes in land use, improvement in biodiversity conservation and socioeconomic impact at the household level, cost-effectiveness of the approach and sustainability.

Pagiola, S., Bishop, J. and Landell-Mills, N. (Eds). (2002). *Selling forest environmental services: Market-based mechanisms for conservation and development*. London: Earthscan.

Forests provide essential environmental services in addition to timber and other resources. However, since users of the environmental services are not charged for the services, there is little incentive on the part of the users to conserve and there is little incentive for providers of the services to maintain and sustain the forest environmental services. Creation of markets for environmental services is one approach to increasing conservation and income generation for forest services. Case studies from around the world document the creation and effectiveness for markets for water, biodiversity, and carbon.

Perrot- Maître, D. and Davis, P. (2001). *Case studies of markets and innovative financial mechanisms for watershed services from forests*. Washington, DC: Forest Trends. Available from the Forest Trends website: www.forest-trends.org/resources/pdf/casesWSofF.pdf

The study presents examples of differing types of financial mechanisms and watershed services from both developing and developed countries: France, Brazil, Costa Rica, Colombia, Australia and the United States. Nine case studies detail the suppliers of the watershed services, the beneficiaries who are paying, the financial mechanism, the legal, governmental and regulatory framework issues concerning equity, the environmental benefits, and the lessons learned. Johnson, White and Perrot-Maître (2001) provide an overall review of the lessons learned from the case studies.

Powell, P., White, A., and Landell-Mills, N. (2002). *Developing markets for the ecosystem services of forests*. Washington, DC: Forest Trends. Available from the Forest Trends website: www.forest-trends.org/resources/pdf/powellwhite_ecoservices.pdf

Developing markets for forest environmental services is similar to the development of any new market. The exception to this similarity is that forest services are “public goods” which require conversion to a commodity and determination of property rights. This process is basically a political process requiring linkages of service providers and beneficiaries, enabling legislation and contractual arrangements, and institutional services for monitoring and certification. To facilitate market development, key issues need further research and understanding: cause and effect relationship of forest management activities and provision of environmental services, development of a range of financial instruments, property rights definition, equity and poverty alleviation goals, and the choice of market mechanism suitable for each particular situation.

Rojas, M. and Aylward, B. (2003). *What are we learning from experience with markets for environmental services in Costa Rica? A review and critique of the literature*. Markets for Environmental Services, no.2. London: International Institute for Environment and Development. Available from the IIED website: www.iied.org/eep/pubs/documents/MES2.pdf

The report presents an overview and analysis of the growth of markets for environmental services in Costa Rica along with a review of the literature. The

review concludes that most markets focus on forest environmental services, that PES is only one of the tools needed to finance conservation, that the INBIO bioprospecting project has generated the least income of any of the environmental services marketed in Costa Rica and is not replicable for other countries, that carbon projects were developed before there was a market for carbon, and that watershed services should be valued before payments for the services are made mandatory. The PES program in Costa Rica serves as a demonstration of the feasibility of a payments for environmental services program but since the government funds the payments through taxes, the program cannot verify the existence of a market for environmental services. Supply of services in Costa Rica exceeds demand and prices would be lower in an open market. The PES program needs further evaluation and monitoring.

Rosa, H., Kandel, S. and Dimas, L. (2003). *Compensation for environmental services and rural communities: Lessons from the Americas and key issues for strengthening community strategies*. Mexico: Programa Salvadoreño De Investigación Sobre Desarrollo Y Medio Ambiente. Available from the PRISMA website: www.prisma.org.sv/pubs/CES_RC_En.pdf

Paying for environmental services can be viewed from the perspective of “conservation without people” or conservation at the lowest cost by excluding the interests of indigenous communities. However, including local communities in payment for environment schemes is necessary from both a practical and ethical viewpoint. Case studies of compensation schemes in Latin America illustrate the connection and impact of rural communities. Three levels of community management and need for natural resources are identified: basic survival, income generation with ecosystem products, and compensation from sources outside the community for natural resource management. Compensation schemes which consider the interests of the community in managing natural resources succeed in improving income levels for the local community.

Rosales, R. (2003). *Developing pro-poor markets for environmental services in the Philippines*. Markets for Environmental Services, no.3. London: International Institute for Environment and Development, Environmental Economics Programme. Available from the IIED website: www.iied.org/eep/pubs/documents/MES3.pdf

A study of the development of markets for environmental services (MES) in the Philippines assesses the economic, environmental, and social impacts of MES. The report identifies six markets for environmental services in the Philippines: landscape beauty, watershed protection, biodiversity protection, carbon sequestration, elevation, and environmental waste disposal. Markets exist at the national and local government level in addition to the development, at the community level, of community-based management of contractual payments. Findings detail the steps in the learning process of decentralizing control and revenues from the national government to local governments and the necessity for increased monitoring and evaluation. Success factors for community-managed

projects are communal ownership of the managing institution, maintaining community traditions, and involving a wide range of participants from landowners to laborers through the use of incentives. Assessment of social impact shows the need for more participation in decision-making at the local level. Although achieving both economic development and environmental protection is possible, at the local level, basic social needs have higher priority for revenue distribution than environmental needs.

Scherr, S. J., White, A. and Kaimowitz, D. (2004). *A New agenda for forest conservation and poverty reduction: Making markets work for low-income producers*. Washington, DC: Forest Trends ; Bogor, Indonesia: CIFOR; Gland: IUCN.

More than 90 percent of the rural poor depend on forests for their livelihoods. Forest protection and restrictions against uses of forest products and services for the local population are not acceptable models. Forest market development strategies including payments for environmental services can create opportunities for income generation.

Scherr, S.J., White, A. and Khare, A. (2004). *For services rendered: The current status and future potential of markets for the ecosystems services provided by tropical forests*. ITTO Technical Series, no. 21. Yokohama, Japan: International Tropical Timber Organization. Available from the ITTO website: www.itto.or.jp/live/Live_Server/724/TS21e.pdf

Ecosystem markets and payment schemes currently in use can be divided into four categories: public funding paid to private owners, trading under a cap or floor, private trades, and ecolabelling. Although not yet a large income source, markets for ecosystem services have grown rapidly in the past decade, primarily in developed countries. Market growth is expected to continue and provide a potentially significant income source for forest conservation in developing countries and a means of poverty alleviation for low-income populations. Government services will be key in providing funding and oversight of market activities and establishment of property rights. Three strategic issues in the development of payment schemes and assessing the potential risks and potential are property rights and the legal framework in developing countries, equal access to markets for low-income producers, and effective institutional controls. Continued research and testing are necessary to understand the potential and effectiveness of ecosystem markets.

Shilling, J. D. and Osha, J. (2003). *Paying for environmental services: Using markets and common-pool property to reduce rural poverty while enhancing conservation*. Technical paper, Economic Change, Poverty, and the Environment. Washington, DC: Macroeconomics for Sustainable Development Program Office, World Wildlife Fund. Available from the WWF website: www.panda.org/downloads/policy/shilling.pdf

Sustainable environmental management and poverty alleviation are not mutually exclusive goals. Environmental improvements can relieve poverty and the rural poor can improve their livelihoods through the sustainable use of resources. Using a market system is one avenue for achieving both of these objectives.

Environmental services normally are considered “public goods” or “public bads”; “public goods” can be undersupplied because of low value and “public bads” oversupplied because of few penalties for negative impacts. The market for environmental services can be established, usually through government interventions, by establishing the value of the environmental services, adjusting property rights and common property resource regulations, and creating and overseeing the market. Equity and poverty alleviation are not byproducts of the market system but are included through administration and regulation of the market system. Successful environmental stewardship programs have several characteristics in common: an educational component about the value of environmental services, property rights adjustments if required, local residents who are involved in resource management and paid for services, valuation of environmental goods, a monitoring framework, and the creation of funds, in the case of global environmental services.

Sick, D. (2002). *Managing environmental processes across boundaries: A review of the literature on institutions and resource management*. Available from the IDRC website: http://web.idrc.ca/uploads/user-S/10378201220MEPfinal_Nov_-2002.pdf

Payments for environmental resources to the rural poor compensate local stakeholders for conservation practices and the loss of livelihood resources. Potential problems in implementation of the payments can include monitoring, the lack of agreement on the value of the services, and the question of to whom payments are made.

Tognetti, S. S. (2001). *Creating incentives for river basin management as a conservation strategy: A survey of the literature and existing initiatives*. Washington, D.C.: World Wildlife Fund.

The report provides an overview of the types of economic instruments, including direct payment schemes, currently in use for biodiversity protection in river basins. A key lesson learned from the overview is that the type of payment system appropriate or most effective is site-specific. Market mechanisms appear to be the most useful instrument when there is a single environmental service identified, when there is a clear contractual link and when there are clearly defined property rights.

Tognetti, S., Mendoza, G., Aylward, B., Southgate, D., Garcia, L. (2003). *A Knowledge and assessment guide to support the development of payment arrangements for watershed ecosystem services (PWES)*. Prepared for The World Bank Environment Department with support from the Bank-Netherlands Watershed Partnership Program.

Available from the IIED Flowline website:

www.flowsonline.net/data/pes_assmt_guide_en.pdf

A critical component of Payments for Watershed Services (PWES) system is the accurate measurement and monitoring of the physical environmental service. Without dependable parameters for the service, the market may not be able to provide expected services and will not be able to retain buyers. Accurate measurements are also essential in the case of conflict over property rights. The point is also made that the measurement and the valuation of the service must be site-specific and cannot be transferred from a temperate forest situation to a tropical forest situation, for example.

Tognetti, S. S., Mendoza, G., Southgate, D., Aylward, B. and Garcia, L. (2003). *Assessing the effectiveness of payment arrangements for watershed environmental services (PWES)*. For presentation at the Third Latin American Congress on Watershed Management, Regional Forum on Payments for Environmental Services, June 9–12, 2003, Arequipa, Peru.

The effectiveness of the delivery of watershed ecosystem services is critical to retaining buyers for the services and sustaining payments for environmental services systems. Initiatives for PES systems often are based on myths and uncertain information about the ability of forests to prevent flooding or stop sedimentation without reference to site specific services. What is needed are analyses for each location of forest services, effective institutional arrangements, property rights implications in the local situation, and involvement of all stakeholders.

Voguel, J. (2002). *Markets or metaphors? A sustainable livelihoods approach to the management of environmental services: two cases from Ecuador*. London: International Institute for Environmental Development.

Important considerations when developing a market for watershed services include social and cultural issues as well as economic and legal issues. The paper documents the development of a methodology based on a sustainable livelihood framework to assess the impact of the watershed services market on the poor.

Winrock International. (2004). *Financial incentives to communities for stewardship of environmental resources: Feasibility study*. Arlington, VA: Winrock International.

Available from the Winrock website:

www.winrock.org/GENERAL/Publications/FinancialFINALrev.pdf

A feasibility study assessed global payments for environmental services programs for carbon, biodiversity conservation and watershed protection. The assessment identified lessons learned and best practices applicable in providing transfer payment schemes for watershed ecosystem services while also providing funding

for local community development and poverty alleviation. Case studies of the Mindanao Geothermal Production Field in the Philippines and the Nepal Electric Authority's hydroelectric facility provide examples of current payment mechanism policies in use in Asia. The study presents a model designed for payments for environmental services for watershed services in Asia. Key requirements of the proposed model are transparent accounting practices, an established fee schedule, participatory monitoring and evaluation and local community governance and representation. The study recommends potential sites for pilot projects funded through the U.S. Agency for International Development.

Wenming, L., Landell-Mill, N., Jinlong, L., Jintao, X., and Liu, C. (2002). *Getting the private sector to work for the public good: Instruments for sustainable private sector forestry in China*. London: International Institute for Environmental Development. Available from the IIED website: www.iied.org/docs/flu/psf/psf_get_privsectr.pdf

The forestry sector in China has shifted toward more private sector management and toward policies favorable to generating income from forest investments but high taxes and government fees have slowed progress. Payments for environmental services at the local level offer one solution. This paper cites examples of payment schemes for watershed protection, biodiversity conservation and landscape beauty in China. Constraints to adopting payments for environmental services in China are low awareness of environmental benefits, low income levels and lack of ability to pay for services, lack of a forum involving beneficiaries in decision making, and the belief that maintaining the environment is a governmental responsibility.

Other resources and websites:

Ecosystem Marketplace

www.ecosystemmarketplace.com

Flows: News on Payments for Watershed Services

www.flowsonline.net/

Forest Trends

www.forest-trends.org/

Katoomba Group

www.katoombagroup.com/

IIED Developing Markets for Watershed Protection Services and Improved Livelihoods:
project website

www.iied.org/forestry/research/projects/water.html

IIED Environmental Economics Programme. Markets for Environmental Services

www.iied.org/eep/pubs/MarketsforEnvironmentalServicesseries.html

PROFOR Financing Sustainable Forest Management

www.profor.info/pages/publications/financing_SFM.html

RUPES (Rewarding Upland Poor for Environmental Services)

www.worldagroforestry.org/sea/networks/rupes/

World Bank. Environmental Economics Group.

www.worldbank.org/environmentaleconomics/