Working Paper

How important will different types of Compensation and Reward Mechanisms be in shaping poverty & ecosystem services across Africa, Asia & Latin America over the next two decades?

Sara J. Scherr, Jeffrey C. Milder and Carina Bracer

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

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The World Agroforestry Centre (ICRAF) and a diverse team of partners were tasked by the International Development Research Centre (IDRC) to contribute to the conceptualization and development of their Rural Poverty and Environment (RPE) programme related to Compensation and Rewards for Environmental Services (CRES) by providing an overview of relevant developments in Africa, Asia and Latin America, a global synthesis of results and recommendations. Truly global in nature, the CRES Scoping Study was undertaken by the following partners and collaborators based in 7 countries across 4 continents.

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Abstract

This paper is the 9th paper in a series of nine interlinked papers commissioned by the Rural Poverty and Environment Programme (RPE) of the International Development Research Center (IDRC) as part of a research project entitled 'Scoping Study of Compensation for Ecosystem Services'. The purpose of this project is to provide the RPE with a broader and richer deliberation on the potential for economic instruments (including market, financial and incentive based instruments) which conserve ecosystem services and at the same time contribute to poverty reduction in the developing world.

The development of Compensation and Rewards for Environmental Services (CRES) will have differential impact on poor resource managers and poor consumers depending upon the characteristics of the resource itself, the financial and other values for different beneficiaries, and the design of payment and market systems. In this early stage of CRES development, there are significant opportunities to shape that development in ways that will have greater benefits for the poor and for poverty reduction. The purpose of this paper is to explore the relative importance of different types of CRES in shaping poverty and ecosystem services across the developing world, as they are likely to evolve over the next two decades.

Keywords

Environmental services, payment for environmental services, compensation and rewards for environmental services, ecosystem services, watershed services, carbon sequestration and storage, economic demand for ecosystem services

Preface

From the beginning of 2006 until March 2007, the World Agroforestry Centre (ICRAF) led a consortium of organizations and individuals from around the world in a pan-tropical scoping study of Compensation and Rewards for Environmental Services (CRES). The scoping study was commissioned by the Rural Poverty and Environment Programme of the International Development Research Centre of Canada (IDRC) to identify critical issues affecting the development, operation, impacts and institutionalization of mechanisms linking beneficiaries of ecosystem services with stewards of those ecosystems. Particular attention is paid to the potential for CRES to alleviate or exacerbate the multiple dimensions of poverty: rights to productive assets, streams of income and consumption, and vulnerability to shocks.

The scoping study included a series of regional workshops held in Latin America (Quito, Ecuador), Asia (Bangalore, India) and Africa (Nairobi, Kenya). Participants presented and discussed practical CRES experiences from across the developing world, experiences which informed and challenged the development of several cross-cutting issue papers. A series of nine working papers have been prepared to summarize the results of the scoping study, including an introductory paper, three regional workshop reports, and five issue papers on key topics.

ICRAF Working paper 32 – Compensation and Rewards for Environmental Services in the Developing World: Framing Pan-Tropical Analysis and Comparison.

ICRAF Working paper 33 – Report on the Latin American Regional Workshop on Compensation for Environmental Services and Poverty Alleviation in Latin America.

ICRAF Working paper 34 – Asia Regional Workshop on Compensation for Ecosystems Services. A component of the global scoping study on compensation for ecosystem services.

ICRAF Working paper 35 – African Regional Workshop on Compensation for Ecosystem Services (CES).

ICRAF Working paper 36 – Exploring the inter-linkages among and between Compensation and Rewards for Ecosystem Services (CRES) and human well-being: CES Scoping Study Issue Paper no. 1.

ICRAF Working paper 37 – Criteria and indicators for environmental service compensation and reward mechanisms: realistic, voluntary, conditional and pro-poor: CES Scoping Study Issue Paper no. 2.

ICRAF Working paper 38 – The conditions for effective mechanisms of Compensation and Reward for Environmental Services (CRES): CES Scoping Study Issue Paper no. 3.

ICRAF Working paper 39 – Organization and governance for fostering pro-poor Compensation for Environmental Services: CES Scoping Study Issue Paper no. 4.

ICRAF Working paper 40 – How important will different types of Compensation and Reward Mechanisms be in shaping poverty & ecosystem services across Africa, Asia & Latin America over the next two decades? CES Scoping Study Issue Paper no. 5.

The working papers are designed for relatively limited circulation of preliminary material. We anticipate that all of the papers will be revised and published in a formal outlet within the next year.

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1. Introduction

Compensation and rewards for ecosystem services (CRES) is a relatively new approach for achieving resource conservation and restoration, through contingent contracts – in many different forms – between ecosystem stewards and beneficiaries of ecosystem services. CRES systems are being encouraged and shaped by several global trends, including increased demand for ecosystem services, the search for new sources of conservation finance, growing business interest in environmental quality; and supportive changes in resource governance at local, national and international levels.

Increased economic demand for ecosystem services. Increased human populations and economic activity have simultaneously reduced the ability of ecosystems to provide key services and increased the demand for and financial value of ecosystem services. Most population estimates project global population will grow by 2 billion over the next 30 years and another 1 billion in the subsequent 20 years – and virtually all of this growth will take place in developing countries. The global commercial demand for food is projected to double over the next few decades, and will triple or more in many low-income developing countries (McNeely and Scherr 2003). Water demand is expected to either double or triple current use over the next 50 years. Irrigation for food is the single largest use of water, and competition over water between food production and environmental values are likely to increase.

Meanwhile, urbanization is shifting the organization of rural lands to produce food and fuel for the cities, and converting habitats to human settlements. Climate change is shifting wild plant and animal habitats, calling into question the long-term value of conventional public protected areas. Biomass, solar, wind and other energy sources are increasing as conventional energy costs rise, altering the economic incentives for land use.

Continued growth of the global and major national economies in the developing world (like China and India) is likely to increase the financial/business value of ecosystem services in ecosystem-dependent industries from water utilities to tourism, and human settlements (Mulder et al. 2006). Recognition by businesses and policymakers of the financial contribution that healthy ecosystems make to society, and fear of the effects of ecosystem degradation, are increasing effective economic demand for ecosystem services.

Search for new sources of conservation finance. Current levels of government conservation finance are grossly inadequate and unlikely to increase enough to conserve critical resources, due to competition for tax revenues. The finance going to conservation, as seen by various indicators, continues to decline, leading to an increased need for private sector conservation financing. For example, the United Nations Conference on Environment and Development (UNCED) and PROFOR suggest that US$31-US$70 billion is required annually just to finance sustainable forest management, resources available from Overseas Development Assistance (ODA) from the Organisation for Economic Co-operation and Development (OECD) Donor countries, funding to forestry reached an all time low in 2004, representing only 0.3% of all ODA[1] from past averages of 0.6% to 1.2% since 1990. Overall conservation financing from

[1] OECD CRS Database figures.

private philanthropy has consistently declined since 1998,[2] and the conservation community estimates a gap of US$27-30 billion annually in financing required for the management and expansion of existing public protected areas (Molnar et al. 2005). With global economic and population growth placing unprecedented pressures on the underlying natural resource 'infrastructure,' it seems likely that many key resources will only be conserved if the costs of conservation management are adequately financed, and returns to conservation management are economically competitive with alternative resource-degrading activities.

Corporate interest in environmental investments. National and international corporations in some sectors have begun to invest in environmental assets, generally for one of three reasons: they are forced to by regulation or the pending threat of regulation in the (near) future; for philanthropic reasons, to enhance their reputation; or because payments deliver a return on their investment (Mulder et al. 2006). To maintain their 'license to operate' in many countries, natural resource-using businesses must demonstrate 'corporate social responsibility' by reducing or cleaning up environmental damage, or demonstrating sustainable source. In more recent years, some industries have recognized the 'business case' for sustainable ecosystem management, in order to take advantage of new business opportunities, secure or sustain critical resource flows, enhance financial value of natural assets belonging to the company, or enabling green 'branding' of products.

A recent study by Mulder et al. (2006), recorded 100 types and more than 1,100 *transactions* of private PES[3] with a distribution across ecosystem services (Waage 2007). The majority of these initiatives take place in Latin America and the Caribbean, especially in the markets for water-related services, biodiversity, carbon and the scenic beauty of the landscape. Payments for biodiversity mostly take place in the U.S., due to the conservation banking market and wetland mitigation banking market. Europe and Africa do not play major roles in any of the markets.

It is noteworthy that most of the private sector entities engaged with markets and payments for ecosystem services have at least some sort of 'business benefit' associated with paying for an ecosystem service. The role of intangibles, such as brand value, is being more closely assessed in terms of climate change. For example, one study found that both airlines as well as food and beverage companies have 50% and 10%, respectively, of intangible market value at risk due to climate change. Investments in ecosystem service markets may play a role in contributing positively to a firm's public image. A number of companies will realize specific financial gains, such as the newly created Australian company New Forests Pty. and the British company ForestRe. In addition, a clear business case exists for two water companies in Costa Rica, namely Matamoros Empresa Eléctrica Platanar (MEEP) and Empresa Servicios Públicos de

[2] The Foundation Center. 2005. Foundation Giving Trends: Update on Funding Priorities, 2005. These data track the donations and grants of 97% of U.S. philanthropic organizations (which accounts for 90% of the world's total). While only grants exceeding US$10,000 are tracked, these represent little more than half of total estimated grant dollars awarded by US foundations

[3] The distinction between the two can be explained by the following example. Both wetland mitigation banking ("water") as well as conservation banking ("biodiversity") in the US account for a considerable market. As an initiative in itself, they represent a single *case*. However, the number of individual *transactions* that take place within the market is far larger; wetland mitigation banking (*water* market) accounts for about 47 transactions and conservation banking (*biodiversity* market) about 930.

Heredia (ESPH), which are paying forest dwellers living in upstream watersheds for maintaining the forests at those places in order to secure continuous water availability.

Supportive changes in resource governance. Important changes in the governance of land and natural resources are enabling the emergence of new contractual agreements between beneficiaries and providers of ecosystem services, including low-income communities. At the local and national levels, the trend is toward decentralization, including the transfer of land and resource tenure to local people (White and Martin 2002; Molnar et al. 2005). This control provides land stewards and communities the opportunity to enter into contracts such as CRES. At the international level, instruments of the Multilateral Environmental Agreements are being shaped to mobilize CRES (see section 3).

Objective and organization of the paper. The development of CRES will have differential impact on poor resource managers and poor consumers depending upon characteristics of the resource itself, the financial and other values for different beneficiaries, and the design of payment and market systems. In this early stage of CRES development, there are significant opportunities to shape that development in ways that will have greater benefits for the poor and for poverty reduction. This paper will explore the relative importance of different types of CRES in shaping poverty and ecosystem services across the developing world, as they are likely to evolve over the next two decades.

The next section of the paper will review the current size, status, and characteristics of different types of CRES. Section 3 will describe the economic and policy processes currently shaping CRES markets and possible points of intervention to develop these markets in ways that are pro-poor. Section 4 draws on the previous sections to analyze the potential of each CRES market sector to provide income opportunities for poor rural communities while protecting the ecosystem services critical to their livelihoods. The final section will identify key research questions that need to be answered in order to realize that goal. The paper draws from a number of sources including business analyses, case studies, academic literature and expert consultation. A key resource was the Ecosystem Service Market Matrix developed by The Katoomba Group's *Ecosystem Marketplace* (2006).

2. Current Status and Characteristics of CRES in Developing Countries

This paper defines a typology of CRES markets based on two key variables – the ecosystem services being transacted and the identity of the service buyers. This typology is used to identify and analyze the current state and characteristics of different CRES market segments.

2.1 Evaluating Markets Segments for CRES

Previous analyses have identified four principal ecosystem services amenable to market transaction: biodiversity conservation, landscape beauty and recreation, carbon sequestration and storage, and watershed protection (Landell-Mills and Porras 2002).

Our typology for watershed protection distinguishes between the protection of water quality and the regulatory of water flow (including flood control). Thus, in total, five services are analyzed.

We identify five basic types of ecosystem service buyers:

1) Public sector buyers, including local, regional, and national governments as well as quasi-public international buyers such as the World Bank and similar multilateral agencies. These buyers typically seek to protect ecosystem services as public goods, on behalf of their constituencies.
2) Private sector buyers who are under regulatory obligation to offset environmental impacts and may do so by purchasing ecosystem service credits. Such buyers are often regulated by 'cap-and-trade' frameworks such as the Kyoto Protocol or 'no net loss' policies for habitat or wetlands.
3) Private businesses or organizations who seek to secure ecosystem services for their use values or for other business benefits. Included within this category are buyers who seek to protect the environment to maintain their reputation or 'social license to operate,' or to gain a marketing advantage by creating a green image.
4) Philanthropic buyers, such as conservation organizations and charitable individuals, who are motivated by non-use values of ecosystem services. This category includes companies and individuals who offset their carbon emissions without any regulatory requirement to do so, and contributors to non-governmental conservation organizations.
5) Consumers of eco-certified products who seek to purchase goods produced in ways consistent with their environmental values – for example, buyers of 'rainforest-friendly' coffee or forest products certified to be grown from sustainable sources.

2.2 CRES for Biodiversity Services

Financial payments for biodiversity protection services are presently estimated to be the largest for ecosystem services associated with land use and land use change, if conservation easements are included (see Annex -Table 1). Payments are made for a variety of stewardship services. One is *payment for access to habitat and species*; this includes bioprospecting rights (rights to collect, test and use genetic material from a designated area); research permits (right to collect specimens, take measurements in area); and hunting, fishing or gathering permits for wild species. A second is *payment for biodiversity-conserving management of habitats*. These include conservation easements (owner paid to use and manage defined piece of land only for conservation purposes; restrictions are usually in perpetuity and transferable upon sale of the land); conservation land lease (owner paid to use and manage defined piece of land for conservation purposes, for defined period of time); conservation concession (owners or stewards on public lands are paid to maintain a defined area under conservation uses only; comparable to a forest logging concession); community concession in public protected areas (individuals or communities are allocated use rights to a defined area of forest or grassland, in return for commitment to protect the area from practices that harm biodiversity); and management contracts for habitat or species conservation on private farms, forests, grazing lands (contract that

details biodiversity management activities, and payments linked to the achievement of specified objectives). A third is *payment for continued or increased presence of particular species* (e.g., breeding pairs of endangered species found on private lands).

Public sector payments. Public and quasi-public agencies are currently the largest buyers of biodiversity conservation services, with payments totaling at least US$3 billion[4] annually. The largest public biodiversity payment for environmental services (PES) programs are the agri-environment payment programs in the United States and Europe, which compensate farmers for providing a variety of conservation-friendly land-use and management practices. Roughly 20% of the farmland in the European Union is under some form of agri-environment program to reduce the negative impacts of modern agriculture on the environment, at a cost of about US$1.5 billion (although much of this land is managed for other ecosystem services, not specifically for biodiversity conservation). In the United States, seven programs authorized under the 2002 Farm Bill encourage the provision of fish and wildlife habitat on private lands through payments for habitat protection and restoration, or for the presence of wildlife on farms. In 2005, these payments totaled over US$4.5 billion. Mexico's public watershed payment program has now incorporated biodiversity benefits (CONAFOR 2005), while Costa Rica's national CRES program compensates landowners for the conservation and restoration of forests.

Public sector buyers include international organizations such as the World Bank and Global Environmental Facility and national governments that enact conservation payment schemes. The World Bank's BioCarbon fund is one of the largest biodiversity CRES programs from quasi-public international organizations, mobilizing US$54 million in its first two years of operation (2004-06). This program aims to sequester carbon while promoting biodiversity conservation and poverty alleviation co-benefits.

Regulation-driven private payments (cap-and-trade systems). Cap-and-trade systems for biodiversity conservation take three basic forms: tradable wetland mitigation credits (credits from wetland conservation or restoration that can be used to offset obligations of developers to maintain a minimum area of natural wetlands in a defined region); tradable development rights (rights allocated to develop only a limited total area of natural habitat within a defined region); and tradable biodiversity credits (credits representing areas of biodiversity protection or enhancement, that can be purchased by developers to ensure they meet a minimum standard of biodiversity protection).

To date, regulation-driven biodiversity CRES have been limited to developed countries, namely the United States, Australia and France. In the United States, for example, at least US$45 million is spent annually on regulatory offsets for biodiversity, including conservation banking; wetland mitigation banking and tradable development rights may also include biodiversity conservation as one of their objectives. Recent legislation in Australia also allows private landholders who conserve biodiversity values on their land to sell the resulting 'credits' to a common pool. The law also creates obligations for land developers and others to purchase those credits (Brand 2002). Several middle-income countries are in the process of developing other cap-and-trade systems for wetland and conservation banking.

[4] All currency figures are provided in U.S. dollar equivalent.

Voluntary private sector payments. Private companies may voluntarily purchase biodiversity conservation services to demonstrate corporate environmental responsibility or to secure use values from biodiversity. A 2002 study of 72 payments for forest biodiversity protection services found that private corporations were the buyers in the largest number of cases (Pagiola et al. 2002), although the total volume of these markets remains small. While biodiversity payments from private companies for business reasons are still nascent markets, examples of such markets exist. For instance, 'bioprospecting' arrangements, in which pharmaceutical companies purchase rights to use chemical compounds and genetic resources, are a US$30 million-a-year market. One promising market sector is voluntary private biodiversity offsets: conservation activities intended to compensate for the residual, unavoidable harm to biodiversity caused by development projects (Ten Kate et al. 2004). To date, at least US$ 20 million in voluntary private biodiversity offsets have been documented, half in developing countries (Ecosystem Marketplace 2006).

Philanthropic payments. Philanthropic buyers of biodiversity conservation services include non-profit conservation organizations, research institutes, foundations, and private individuals who are motivated by protecting non-use values of biodiversity. Conservation organization, such as Conservation International and The Nature Conservancy internationally, and many national NGOs and trusts reward or compensate private landowners for conservation use of their lands. Such projects may involve agreements with low-income landowners and managers to carry out habitat and wildlife conservation in exchange for monetary or non-monetary compensation. A McKinsey-World Resources Institute-The Nature Conservancy report estimated the value of annual international finance for conservation (protecting land from development) in developing countries at US$2 billion, with the forest conservation component a large share of that. Buyers are predominantly development banks and foundations in the U.S. and Europe.

Eco-certified products. Eco-certified products are a large and rapidly growing market: as of 2006, this market was valued at US$26 billion worldwide with a growth rate of 30% annually (Ecosystem Marketplace 2006). The value of certified timber and non-timber forest products is estimated at a current value of US$5 billion and is estimated by the Forest Stewardship Council (FSC) to top US$15 billion in the next decade (FSC estimate, 2005 from Ecosystem Marketplace). Pressures continue to increase on major international trading and food processing companies to source from suppliers who are not degrading ecosystem services (Clay 2002). Demand for organic farm products is increasing at 20% per year, and the international organic movement is strengthening standards for biodiversity conservation (IFOAM 2002). Rainforest Alliance has initiated a labeling program with explicit biodiversity criteria, and are looking to assess impacts at a landscape scale (www.rainforestalliance.org). Of course, most of value of eco-certified products is for the products themselves, with a relatively small and unspecific premium paid by the consumer for the eco-friendly production practices, including biodiversity conservation. Although consumers purchase eco-certified products for a host of reasons (including health, social justice, and environmental concerns), biodiversity conservation is the ecosystem service most closely associated with consumer preference for certified products.

A new, but evolving segment of this market is the labeling of products from widely-appreciated unique habitats, such as particular national parks or natural features (e.g., Chesapeake Bay-friendly chicken in the US) or ecozones (South African Cape wines).

Producers whose production systems are certified to be managed in ways that conserve those special habitats are allowed to use the labels.

2.3 CRES for Landscape Beauty and Recreation

This category encompasses a variety of services including the conservation of wildlife for consumptive use (hunting) or non-consumptive use (viewing) and the protection of landscape beauty. Although these services often overlap with biodiversity services, the commodity being purchased by tourists is an access right to scenic beauty or wild species, not biodiversity per se. Most CRES are direct public or private sector payments, with scattered projects supported by philanthropic foundations or trusts.

Public sector payments. Payments to land stewards by enterprises that cater to tourists are typically negotiated on a case-by-case basis. In a review of landscape beauty payments, the most frequent market-based mechanisms used to attach value to these services were: access rights/entrance payments such as visitor fees (50%), package tourism deals (25%) and management arrangements or projects (25%) (Landell-Mills and Porras 2002). Many of the local arrangements for wildlife protection with local communities in Africa have been set up as a form of CRES (Bond 2005). In some national parks, however, payments are neither voluntary nor conditional: local communities are required to curtail their activities in the park, but as compensation they receive a portion of park revenues. In the United States, public hunting and fishing permits are worth tens of millions of dollars. Some European countries (e.g., Switzerland) make very large payments to farmers for maintaining pastoral landscapes that attract international tourists.

Private sector payments. Increasing financial values for landscape beauty and recreation have stimulated significant private sector investment, by many small-to-medium-sized actors. In the United States, many farms, ranchers and other rural landowners supplement their incomes through private access fees for recreational fishing and hunting on their land, and manage their resources to attract fish and game. Some farmers are also tapping into new 'agro-eco-tourism' markets in which biodiversity-friendly farming practices, on-farm conservation of wild habitats and wildlife attract tourists to stay overnight at farmsteads. There are also new markets arising for real estate of high ecological value that will attract high-income buyers for person or commercial use, as in cases in Costa Rica, Chile and California (Scherr et al. 2007). These markets provide a financial incentive for landowners to invest in ecosystem restoration or conservation.

There are no global estimates of scale of CRES for landscape beauty and recreation. The Ecosystem Marketplace estimates that US$1 billion is spent annually on ecologically-responsible tourism (a small share of the huge total market of 'nature tourism' – 20% of all tourism – that relies for its value on natural resource assets).

2.4 CRES for Watershed Services

Payments for watershed protection services can be grouped into two categories: water quality and water flow regulation (including flood control). These categories, while

linked, often have different beneficiaries and are furthered by different land use practices; thus, they are commonly the focus of separate markets.

Before enumerating each segment of the watershed service market, it is helpful to explore how the scale of watershed function influences demand for watershed services. Specifically, watershed protection services tend to be of interest mainly to local and regional users – in contrast with carbon sequestration and many biodiversity conservation services, which benefit the global community (Landell-Mills and Porras 2002). This characteristic is both an asset and a liability for developing watershed CRES. On the positive side, it is relatively easy to identify the users or beneficiaries of watershed services, and many promising categories of buyers exist, including municipal water suppliers, hydroelectric facilities, industrial users, and irrigation systems. Furthermore, the critical day-to-day use value of these services for the beneficiaries may make revenue streams less subject to market fluctuations than CRES mechanisms driven by philanthropy, goodwill, public relations, or long-term global environmental well-being. A major downside of the local orientation of watershed service benefits is that there is little scope for attracting payments from the international community for either the use values or the non-use values of watershed services. Thus, there is currently little or no market for watershed services purchased by philanthropic buyers or demanded by individual consumers through their purchase of eco-certified products.

Public sector payments. As shown in Annex (Table 2) public payments for watershed protection currently represent the largest market for watershed services, at up to US$2 billion annually worldwide. These payments are driven by governments' recognition of watershed services as being a critical public good for human subsistence, health and safety, agriculture, and economic development. Monetarily, public watershed payments have been concentrated in the United States and China, but numerous smaller public watershed CRES programs have been established in Latin America, Africa, and Asia (Katoomba Group 2006).

A major driver of CRES innovation is that investments in sustainable watershed management are often substantially cheaper than investments in new water supply and treatment facilities. By investing approximately US$1 billion in land protection and conservation practices, New York City has avoided spending US$4-6 billion on filtration and treatment plants (Echavarria and Lochman 1999). Other cities in the United States - Portland, Oregon; Portland, Maine; and Seattle, Washington - have found that every US$1 invested in watershed protection can save anywhere from US$7.50 to nearly US$200 in costs for new filtration and water treatment facilities (Trust for Public Lands 1997). In South Africa removing thirsty alien tree species in Cape Town's watershed and restoring native vegetation produces water at a fraction of the cost of water delivered through diversion or reservoir projects (Gelderblom and van Wilgen 2000). Many of these programs have been designed specifically for co-benefits to local communities, and some (e.g., Mexico, South Africa) specifically to benefit poor groups within those communities.

The local orientation of watershed service benefits means that, in the long term, developing country watershed CRES must be funded primarily by developing country water users. Whether this is feasible may depend on the context. The largest of the public watershed CRES schemes in developing countries – those in China, Mexico, and Costa Rica – are significantly funded by internal sources, although Costa Rica's program also

relies on external subsidies (Chomitz et al. 1998; Alix-Garcia et al. 2005). On the other hand, the development of local watershed CRES programs in developing countries (i.e., programs where costs are borne locally and not distributed across an entire province or nation) may be difficult where the water users themselves are poor and unable to afford payments to upstream stewards. For example, funds collected from household water users in the Ecuadorian town of San Pedro de Pimampiro were able to cover only a fraction of the payments made to the upstream community; outside funds were needed to subsidize the payments as well as the substantial costs of monitoring and administration (Echavarria et al. 2004).

Payments for watershed management for flood and disaster prevention and mitigation are still mostly at the conceptual stage, although proposals are on the table in Mexico, for example. In most models, payments are made by government agencies, but sometimes with financing through levies on landowners within the watershed. Large private insurance and re-insurance companies, such as Swiss-Re, have demonstrated interest in promoting such schemes.

Regulation-driven cap-and-trade systems. Markets for watershed services driven by government regulation are currently operating in only a few countries, but the size of these markets is already relatively large – US$1 billion or more (Ecosystem Marketplace Matrix 2006). For example, wetland mitigation banking in the United States (in this case, to protect hydrological role of wetlands in flood control and dry season water availability) and salinity trading (for water quality) in Australia both use a 'cap-and-trade' framework to encourage or require landowners and developers to trade credits for specific watershed service. Not surprisingly, regulation-driven markets for watershed services concentrate in developed countries, reflecting the generally weaker state of environmental regulation in developing countries as well as the significant administrative, legal, and enforcement infrastructure needed to develop cap-and-trade type markets. Going forward, there is substantial potential for new and expanded cap-and-trade watershed service markets, principally for water quality. These are likely to concentrate in developed countries for the same reasons they have historically done so. However, emergence in developing and middle-income countries is also possible; for example, Colombia has already implemented a water quality trading program and South Africa has begun to design such a system (Ecosystem Marketplace Matrix 2006). To date, these systems have rarely incorporate pro-poor elements into their design.

There are large private markets for water quantity trading among large water users in countries such as the United States, Australia, Chile, and Mexico, but these are actually markets for ecosystem *goods* (water), not services of watershed protection, and thus not discussed in this paper.

Private payments. Compared to public payment schemes, private voluntary watershed CRES consist mainly of small, localized markets totaling about US$5 million annually, worldwide (Ecosystem Marketplace Matrix 2006). Most payments have been by water or other beverage bottling companies for whom water quality is a key attribute, by farmers dependent on flow of irrigation water, or by utilities and industries dependent upon a regular supply of water for manufacturing processes. These have typically not focused explicitly on pro-poor arrangements, but where poor communities are the main watershed stewards, they have been recipients of the payments (sometimes in form of community funds, etc.).

One challenge hindering the development of watershed service markets is the difficulty of translating user benefit and 'theoretical' willingness to pay into actual revenue streams. Even when private users recognize the value they derive from watershed services, they may be unwilling to pay for these services unless they perceive a threat to continued service delivery that is both immediate and likely to be mitigated as a result of their payment. Since land stewards are rarely able to exclude beneficiaries from using the watershed services that flow from their land, private users have a strong incentive to become 'free riders' and land stewards have little leverage to command payments. However, given the extensive reliance of private agricultural and industrial water users on watershed services, private voluntary CRES markets have the potential to proliferate if land stewards and buyers can overcome these challenges through collective action. Current efforts are underway to do exactly this (Bond 2005).

2.5 CRES for Carbon Sequestration and Storage

Public knowledge of the risks of climate change has led to pressure on governments and society to engage in activities to reduce carbon emissions. Projects called Land Use, Land Use Change and Forestry (LULUCF), and recently changed to integrate Agriculture with Forestry and Other Land Uses (AFOLU), are the class that is discussed in this paper, relevant to poor land owners who may potentially participate in the market. Apart from activities of reforestation and afforestation, we also include information on soil carbon sequestration, agricultural activities, and avoided deforestation. Biofuels and methane management are other areas where the carbon market impacts land based communities but these sectors are not covered in depth here.

The carbon market for landowners in developing countries operates according to three main mechanisms: i) carbon emissions offsets for the regulatory market, as established by the Kyoto Protocol (mainly public sector and private companies as buyers), ii) eligible offset activities in emerging regulatory markets in the U.S. and Australia operating outside the Kyoto Protocol (mainly for public sector, private buyers) and iii) the sale of voluntary carbon offsets coming from LULUCF projects and activities, (which is where individual consumers, philanthropic buyers, and private sector buyers are mainly found). Mechanisms which do not allow trade in land-based project credits, such as the European Emissions Trading Scheme are not covered in this section.

Regulatory carbon market. The Clean Development Mechanism (CDM) is a project based transaction system that trades in CO_2 removal activities, including afforestation and reforestation, to provide carbon offsets in this market segment. Once projects are registered and approved, a Certificate of Emissions Reduction (CER) is the instrument created that can be traded. The Kyoto Protocol authorizes only afforestation and reforestation activities, excluding soil carbon storage, sustainable forest management, and avoided deforestation. Agricultural management and avoidance of forest degradation are two other land-use sectors that are currently excluded from the CDM.

The atmospheric benefits from CDM projects result in tradable permits that can be sold as carbon credits, helping Annex 1 countries[5] satisfy their emission reduction commitments (although only 1% of the 5.4% they are required to reduce can come from CDM credits). Buyers are thus Annex 1 signatories to the protocol, as well as private

[5] Annex 1 countries: http://unfccc.int/parties_and_observers/items/2704.php

companies from developed countries (operating mainly through public-private funds). If the full magnitude of 1% was purchased through the CDM, US$300 million value of trades in offset projects is estimated. The reality is that only US$100 million[6] has been transacted due to current limitations of the Mechanism. Sellers are project developers from developing countries that comply with the rigorous verification and registration processes established by the CDM (see Annex , Table 3).

A class of temporary certified emissions reductions credits was created for LULUCF carbon credits due to concerns over 'permanence'. Special accounting of emission removals, baselines, additionality and leakage were also defined for LULUCF projects by the CDM Executive Board. To date, five LULUCF methodologies have been approved by the CDM for afforestation on degraded land, reforestation with multiple use forest on degraded land with harvesting, afforestation/reforestation for industrial/commercial uses, and through control of animal grazing and assisted natural regeneration, and of land under agricultural use[7], and one small scale <8ktCO_2 absorption methodology have been approved. The Moldova project was the first and only to be registered as of this paper (in April 2006), while the other 5 methodologies are at the validation stage (www.cd4cdm.org UNEP RISOE CDM Analysis).

The approved LULUCF methodologies can be used by communities engaging in these types of activities, unless they wish to and are able to undertake the lengthy and costly process of developing their own methodology. Guidelines for small scale projects were put in place in 2003, but only one such methodology exists (AR-AMS0001), and no LULUCF projects have been verified in this modality[8]. This small scale modality of the regulatory market is the one that is expected to more easily include more pro-poor carbon transactions, although even to reach the 8000 tons of carbon minimum, institutions and organizations of pro-poor carbon sellers may need to work together to jointly propose small scale carbon offset methodologies and projects, but this has not been demonstrated.

The price per carbon credit is not very attractive given the transaction costs of obtaining them, and the fact that they expire. FAO high-quality LULUCF projects may cost US$3 - US$10 or more per ton of CO_2equivalent (US$10 - US$35 per ton of carbon) (Trexler 2003). BioCarbon Fund projects are expected to deliver between 400,000 and 800,000 tons of CO_2 equivalents over a period of 10-15 years. In return, a typical BioCarbon Fund project will receive about US$2-3 million in payments – which is US$3-4 per ton of CO_2e[9] (Pearson et al. 2005).

Low-income communities are finding it difficult to participate in the CDM market at this time, due to the above disincentives and the lack of affordable advisory and project development support services. The pipeline of community-based CDM projects is primarily found in the World Bank BioCarbon Fund and others supported by non-profit conservation groups.

[6] Ecosystem Marketplace Ecosystem Services Matrix Feb 2007
[7] Moldova, China, Brazil, Albania and Honduras
[8] http://cdm.unfccc.int/Projects/registered.html
[9] CO_2e is an abbreviation of 'carbon dioxide equivalent' and is the internationally recognized measure of greenhouse emissions.

Non-Kyoto Regulatory Carbon. Although Australia and the United States did not sign on to the Kyoto Protocol, carbon emission markets and transactions are evolving in these, the two highest per capita carbon-emitting countries. The Northeastern United States evolving Regional Greenhouse Gas Initiative (RGGI) will include afforestation, and methane capture from farming, but only from lands in the United States. The Oregon Standard that was implemented in 1997 is open to land based carbon sequestration internationally. The third scheme in this category, the New South Wales also provides for carbon sequestration through forestry.

In Oregon, emissions reductions requirements for new power plants can be offset by paying mitigation funds to a non profit organization called Climate Trust, which implements projects that avoid or sequester CO_2 emissions. Three of fourteen projects in their portfolio are land based (forest) sequestration projects, including one in Ecuador by partners Jatun Sacha and Conservation International for 65,500 metric tons in a 99-year project lifetime (www.climatetrust.org). Offset project credits sell between US$6-US$10/ton of CO_2e (Bayon et al. 2007).

Eight states of the east coast of the US are developing the Regional Greenhouse Gas Initiative (RGGI) to regulate emissions from electric utilities in the region. Only 3.3% of emissions may be covered by offsets in projects occurring offsite from the emission, and this includes capturing landfill methane, planting trees and energy efficiency programs (Biello 2006), but this has so far planned only to include afforestation, and only from land in the United States[10]. As such it does not apply to this research on globally defined pro-poor Compensation and Rewards fro Ecosystem Services.

The New South Wales Greenhouse Gas Abatement Scheme launched in 2003 with a focus also on reducing energy sector emissions. It uses a cap-and-trade market mechanism and excessive emissions can be mitigated via surrendering the NSW Greenhouse Gas Abatement Certificates (NGAC's), or by paying an US$11/tonne fine. The mitigation market trades 7 million tons of CO_2e at an average price of US$10. Certificates can be created from carbon sequestration projects from forests located in Australia which meet the sinks regulations of the Kyoto Protocol, and conditions set out in the NSW Framework on Carbon Sequestration. The only supplier to have actually delivered NGAC's created through carbon sequestration is Forests NSW, the government forestry agency, which sold 65,000 NGACs in 2005. In April 2006, energy producer Country Energy and forester, CO_2 Group signed a deal to provide 30,000 hectares of Mallee eucalypt planting in rural NSW. The contract is to provide 3.2 million tonnes of carbon pollution offsets – making the contract worth about AUS$41 million (Hanley 2006).

Voluntary Carbon Market. The voluntary carbon market has grown rapidly over the last 15 years. From the perspective of voluntary transactions that relate to land based carbon, we include the Chicago Climate Exchange, where individual governments, private sector buyers and individuals purchase credits, as well as land based credits that are sold by a large number of existing retailers. By 2005, the voluntary market grew to US$46 million (7.5 million tons), and some estimate that by 2006 it could increase up to 50 million tons of carbon equivalent (Capoor and Ambrosi 2006).

[10] New York State Dept of Environmental Conservation website at: http://www.dec.state.ny.us/website/environmentdec/2006a/greenhousegases122005.html

Retailers that sell carbon emission offset credits to various types of buyers often include carbon sequestration projects in their portfolio. A 2006 study reports that 56% of the credits sold from retailers originate in carbon sequestration projects (Harris 2006) and most are from projects in developing countries. Since the voluntary market allows greater flexibility in deals between private sector buyers and carbon 'growers' or ecosystem managers that sell the carbon offsets, there are both increased interest in this sector, but similarly depending on the standards demanded and risk tolerance of the buyer, potentially more difficulties. A much smaller segment of buyers are individuals who offset their personal and household emissions buying from retailers.

Motivations moving buyers include the potential of achieving multiple benefits with LULUCF projects, including social, economic and biodiversity improvements. 40% of European voluntary carbon purchasers would pay a premium for carbon obtained from multiple benefit projects (Dannaker 2006). This market segment also includes forest conservation projects, as well as reforestation and afforestation.

Governments are among the buyers in the voluntary market, often channeling their support to carbon projects through international assistance, including overseas development assistance, World Bank and the Global Environment Facility (GEF). No developing country government is buying carbon to directly offset their own emissions, as researched by the authors. Nonetheless, both the Argentine Carbon fund and Mexico's Carbon Biodiversity Agroforestry (CABSA)[11] Ecosystem Services Program serve as brokers, helping to prepare carbon projects for sale. In the case of the Argentine Fund, credits are purchased from the projects to then be re-sold (Krolik 2006).

The Mexican CABSA PES Program is aimed at carbon, biodiversity & agroforestry systems. It started in 2004, and until 2007 funding was obtained from the same source of money as the National Forestry Commission's Hydrological Services Program, namely, via a targeted tax on industrial water use. Allocation to both programs comes from the federal budget on a yearly basis. Single landowners can only apply for one of the programs only, and receive payment for one ecosystem service. Between 2004-2007, the program gave seed money to support development of a required land management plan, secondly, to help cover project implementation costs, and thirdly, to provide technical support to participants to establish high quality carbon sequestration projects. No support is provided to find a market to sell to.

Chicago Climate Exchange (CCX) is a voluntary, but legally binding rules-based greenhouse gas emission reduction trading system[12]. Companies join CCX voluntarily and trade carbon financial instruments, measured in tons of Co2e. The Chicago Climate Exchange traded 1.45 million tons of Co2e in 2005, for a total value of US US$2.7 million (Bayon et al. 2007). While only $1/50^{th}$ of CCX transactions are project-based offsets, the remainder are trades of allowances originating from members reducing their emissions and buying and selling these allowances. The CCX does allow carbon from developing countries and have recently approved carbon from a private company based in South Africa Precious Woods for sale through CCX. That carbon, in fact, is now being sold to the World Bank to make their operations 'carbon neutral'. Average trading

[11] Programa para Desarollar el Mercado de Servicios Ambeintales por Captura de Carbono y los Derivados de la Biodiversidad y para fomenter el establecimiento y mejoraramiento de Sistemas Agroforestales. In 2005, CABSA allocated US$10 million for 169,031 hectares.
[12] www.chicagoclimatex.com

price for 2006 of the Chicago Climate Exchange was US$3.6/ton (inclusive of all types of offset projects).

Sellers of LULUCF carbon offsets include poor and non-poor resource owners mostly in forested areas, although some lesser biomass ecosystems are also being included in these transactions. In most cases, communities in tandem with NGO's engage in transactions with carbon buyers, while many international donors have their own links to communities and carbon sellers in less developed countries.

2.6 Markets that Bundle Ecosystem Services

For a number of reasons, it may be desirable to 'bundle' payments for different ecosystem services from the same resource. As indicated above, the level of payments in most CRES is not, under current market conditions, generally high enough to offset opportunity costs or cover necessary investments for the change in land use. It is essential to have complementary income flows, either from commercial and subsistence products from the resource, or from other CRES.

Theoretically, it is feasible to bundle carbon sequestration or storage services with most of the other ecosystem services, as long as additional carbon is being sequestered that would not be sequestered under the status quo land use. However, efforts to institutionalize requirements for other ecosystem co-benefits from the CDM were unsuccessful for political reasons. Nonetheless, a number of other initiatives are encouraging such bundling, including the World Bank's BioCarbon Fund, the Climate, Community and Biodiversity Alliance, and the new carbon fund being developed by the United Nations Development Programme for projects that also support the Millennium Development Goals. Conservation organizations such as The Nature Conservancy and WWF are seeking to incorporate biodiversity objectives systematically into watershed protection payments. At this time, however, only a small portion of CRES payments are for bundles of ecosystem services; most are for single services. Some agri-environmental payments explicitly exclude opportunities for bundling, to avoid 'paying twice' on the same land.

New approaches are being explored in some public payment systems, particularly in developed countries, to assign overall ecosystem values to lands, so that landowners who have been good stewards in the past would receive payments as well as those who improve degraded lands, and so that integrated ecosystem service management would be recognized and encouraged. It is expected that as markets mature, new institutional mechanisms will arise to enable bundling.

3. Economic and Policy Processes Shaping CRES and their Impact on the Poor

How will the evolution of CRES affect the poor? The answer depends upon the success with which the rural poor and their advocates can shape these markets to meet pro-poor criteria. This section highlights the ongoing political debates and economic factors affecting market development, to identify where strategic intervention points may lie.

3.1 National and Local Processes Shaping CRES Markets

Core national and local processes will shape economic demand for ecosystem services, and also the institutions evolving for CRES. Key elements are trends in ecosystem health, trends in environmental policy, socioeconomic trends, and local awareness of CRES.

Trends in ecosystem health. Investment in institutional development for CRES is likely to accelerate in part due to perceived importance of ecosystem services and threats to them. Thus countries and regions will vary depending upon the impacts of climate change, economic threats from invasive species (e.g., to tourism or water resources or agriculture). Improved quality of science on ecosystem services will likely facilitate the development of CRES, by quantifying the financial values for beneficiaries, and reducing the risks to both buyers and sellers of services. Politically powerful or vocal groups affected by deteriorating ecosystem health, are likely to shape the rules of new mechanisms.

Trends in environmental policy. In many developing countries there is a lack of awareness of basic environmental issues, and weak capability of political figures and judges to handle environmental questions. Environmental laws remain quite weak, particularly in Africa and parts of Asia. A key question is whether environmental policy will become stronger or weaker in these countries. An element of the debate on CRES is likely to be whether these new instruments are distracting attention from key conservation issues, or represent an effective response to them. Overall trends in corruption will have a large impact on environmental policy generally, and particularly for ensuring the credibility of CRES contracts, and trust of market actors in public institutions responsible for collecting and disbursing payments.

As governments and civil society increasingly recognize the critical role of ecosystems in underpinning prosperity, political processes will accelerate demands on governments and businesses to protect resources. The relative balance in using different political instruments to address this goal will depend in part on political factors, including the balance of political power of beneficiaries and providers of ecosystem services, and the capacity of the state to implement direct regulation of ecosystems or mobilize public investment. CRES can in some cases de-politicize environmental policy by creating a systematic mechanism for making claims on resources and demand stewardship. For such systems to be accepted, they must be seen as legitimate, in terms of effectively protected resources for the public good and equitably allocating costs and benefits. Their role in contributing to national Poverty Reduction Strategies needs to be clarified, and CRES mobilized more strategically to jointly achieve poverty reduction/alleviation and ecosystem goals.

Socioeconomic trends. Urbanization trends may raise awareness of economic dependence on healthy ecosystems and thus the openness of beneficiaries to the use of CRES, particularly under political economy conditions where urban groups cannot easily impose priorities on rural resource owners and managers. Gaps between rich and poor groups are likely to widen, with large numbers of people stuck in absolute poverty. Meanwhile, the pressures of economic growth may lead to policies that encourage

foreign direct investments that have negative impacts on the environment. The attraction of pro-poor CRES will vary by country and region depending upon trends in poverty levels. At the same time, there is likely to be a modest increase in businesses related to environmental conservation, but these will likely be targeted on small parts of the landscape, specific economies and selected natural resources.

Local awareness of CRES. Opportunities for low-income communities to become engaged profitably in CRES will depend centrally on the degree to which they are aware of these opportunities and able to engage in the design of policy and program frameworks. New mechanisms are arising to raise awareness. Examples include the Community Forum of the Katoomba Group (www.katoombagroup.org), a number of Indigenous Peoples organizations that are briefing members about CRES (e.g, Sierra Gorda in Mexico), and the new Community Knowledge Service for Biodiversity and Livelihoods that is promoting knowledge-sharing among communities engaged actively in ecosystem management (www.equatorinitiative.org/cks).

3.2. International Processes

A number of international processes are accelerating the development of CES, and are subject to influence towards pro-poor paradigms during this transitional phase. Key processes to monitor and influence include: transformation of agricultural subsidies, the search for new modalities to implement multilateral environmental agreements; growing investments in CRES by multilateral development banks, the private sector and the international conservation community; and global dialogues on natural resource rights. Evolving international dialogue is likely to shape CRES systems directly, and broaden the range of models for both negotiated contracts and market mechanisms well beyond the models currently popularized by the Costa Rica public payments, the United Nations Framework Convention on Climate Change (UNFCCC) flexibility mechanisms, and U.S.-Europe agri-environmental payments.

Transformation of agricultural subsidies. The participation of farmers and farming communities in CRES for biodiversity conservation in developing countries will be driven by international trade agreements, national farm policies in many countries are shifting from providing agricultural subsidies to focusing on other means of supporting rural livelihoods, such as agri-environmental payments. This trend is most profound in the United States and Europe, but developing countries have also been required to cut certain types of agricultural subsidies under World Trade Organization (WTO) agreements. In the relevant countries, this shift could significantly increase public payments to farmers for watershed protection, biodiversity conservation, and other environmental services. The ability of poor farmers to participate in CRES programs may depend on whether these programs allow land to remain in agricultural production or require land to be taken out of production. This, in turn, may hinge on the availability of scientific studies demonstrating the potential of agricultural production systems employing particular management practices to provide desired ecosystem services, as has been done in the New York City-Catskill watershed CRES program.

Multilateral Environmental Agreements. Most of the multilateral environmental agreements (Convention on Biological Diversity (CBD), Convention to Combat Desertification (CCD), UNFCCC and Ramsar) have begun to discuss and pursue ways

for signatory governments to achieve convention objectives through CRES. In 2004 and 2005, international meetings were convened to discuss the potential to develop CRES that integrate ecosystem services of interest under various agreements (UNEP 2005). Opportunities include the inclusion of an international version of wetland mitigation banking into RAMSAR, or incentive-based schemes for protecting migratory species under Convention on the Conservation of Migratory Species of Wild Animals (CMS) or Biodiversity Offset payments discussed within the Convention on Biological Diversity. The international conventions may also define and constrain the possibilities for CRES mechanism; e.g., the UN CBD defines property rights to genetic resources, which in turn defines opportunities and constraints for trade of those resources.

CRES will be affected by trends in regionalization of economies, which may require agreed rules for CRES. With the increased sharing and managing of transboundary resources, regionally integrated CRES policies and instruments may be needed, or the institutional challenges may reduce the likelihood of using such tools. Overall, international processes are beginning to support CRES as having potential to support conservation finance (Govt. of Costa Rica et al. 2005).

Inter-governmental investment in PES. Almost all of the international development banks (World Bank, Inter-American Development Bank IADB, Asian Development Bank (ADB), African Development Bank (AfDB)) and other agencies (GEF and the International Fund for Agricultural Development (IFAD)) have begun to invest in the development of CRES schemes, primarily in the form of public payments, particularly for biodiversity and watershed services (Forest Trends 2006). This second generation of payment systems is still largely modeled on earlier Costa Rica PES and U.S. agri-environmental payments, with a focus on individual farmers and forest owners, central designation of criteria, and dependence on public sector finance. As these are implemented in areas with different tenure arrangements, weaker public sector agencies, etc., it can be expected that the models will diversify.

Increased corporate social responsibility among many multinationals, especially those based in North America and Europe, may welcome CRES as market-friendly approaches to environmental protections. On the other hand, increasing foreign direct investment for growing commodity markets (e.g., agricultural commodities for export from Africa to China and India, biofuels exports) may increase negative effects on environment and discourage or overwhelm local initiatives for CRES. There is considerable interest among the inter-governmental agencies in promoting pro-poor models for CRES that would contribute to achieving the Millennium Development Goals.

International conservation agency investment in PES. International conservation organizations have long been in engaged in financing local conservation projects, particularly for biodiversity. Mechanisms used have largely been direct purchase of land, subsidies for conservation management implemented through trust funds; and – particularly in higher-income countries – conservation easements that provide their owners with tax benefits. Conservation International (CI) has been involved in direct payments for biodiversity conservation, including conservation concessions, and were leaders in the CCBA, an initiative to promote carbon projects with biodiversity and livelihood co-benefits. While WWF was opposed to carbon payments for LULUCF for some time, they are now experimenting with approaches for watershed payments and even some voluntary carbon market. These organizations will likely become significant

philanthropic buyers and intermediaries in markets for voluntary carbon and biodiversity offsets, while also catalyzing and supporting institutional development for private sector buyers. While the first generation of CRES projects by this sector were highly focused on ecosystem benefits, those now in the pipeline often have explicit objectives to benefit low-income people living in the target ecosystems.

Private financial investment in PES. While those concerned with sustainable rural development and poverty reduction have been exploring CRES through pilot field projects and public finance initiatives, the private financial sector is entering these new markets from entirely different perspectives. Major corporations, such as Citibank and Goldman Sachs are exploring commercial products and services they can provide to the growing international ecosystem service markets. (Goldman Sachs recently set up a center to support innovative approaches.) The major initial driver was opportunities in the carbon market, but a number of companies are also developing financial products for watershed services. For example, the insurance company Forest-Re is developing products for large-scale commercial carbon and watershed service projects. Some companies, particularly in the forest industry and wetlands development in the U.S. and Australia are positioning themselves as large-scale commercial sellers and real estate developers for selling ecosystem services. As intermediary institutions develop to serve these larger-scale commercial markets, they may influence the commercial environment for low-income sellers, and certainly their position in and share of the value chain.

Global dialogues on natural resource rights. The emergence of CRES as an instrument for investment in ecosystem stewardship is occurring in parallel with broader international dialogues and policy change about rights and benefit-sharing from biodiversity and ecosystem management. Devolution of forests, rangelands and conservation areas to local communities, and strengthening of indigenous rights, is changing the terms of negotiation between suppliers and beneficiaries of ecosystem services. Developing platforms for public consultation on conservation policy are also creating both contexts and opportunities for negotiation on ecosystem services, as well as land rights and use/harvest rights for products (further discussed in ICRAF Working Paper no. 39).

Scientific advances in biodiversity assessment and monitoring. One limitation to the proliferation of biodiversity conservation payments is the difficulty in verifying that services have been provided and in establishing equivalency units or a tradable 'commodity' for biodiversity conservation (Agius 2001). Buyers of biodiversity conservation services will be willing to pay only if they can be reasonably certain that the services are actually being provided. Yet, the complex nature of biodiversity itself as well as the difficulty in measuring it either directly (which is extremely time consuming) or indirectly (which relies on proxies, of which few reliable ones exist) present significant challenges. Some credible methods for quantifying the biodiversity benefit of land use or management practices have been developed and may be used in the context of CRES programs. But large-scale biodiversity payments will require more scientific development and new, cost-effective monitoring methods (Scherr et al. 2007a).

3.3 Processes Affecting CRES for Biodiversity Services

Biodiversity conservation services are generally considered to be the most difficult ecosystem services to be transformed into defined units marketable by landowners and managers. This is mainly because the science for tracing the link between biodiversity, management of resources to conserve biodiversity, and financial benefits for different actors is still in its infancy. Biodiversity conservation services are also the least likely to be transformed into 'commodities,' which are by definition standardized and thus easily exchanged. Thus biodiversity market segments are likely to operate as 'niche' markets for some time, without the economies of scale that characterize commodity markets.

These constraints are loosening, however, as specific private economic benefits from biodiversity are being identified, as governance for biodiversity protection is developing relevant public and private payment mechanisms, as businesses are being required – or determining it is in their business interest – to limit their biodiversity impacts, and as opportunities for 'bundling' biodiversity benefits into other types of ecosystem services are being devised.

Increased scarcity and value of biodiversity services providing private benefits. Land stewards may, in fact, find private beneficiaries of the biodiversity conservation services they provide, who are willing to pay for these services as their scarcity increases. The Millennium Ecosystem Assessment quantified the huge economic losses associated with loss of wild pollinators, leading to new initiatives to pay for pollinator habitat protection. Likewise, financial value of spawning and other critical habitats for commercial fisheries are growing, creating an (as yet largely unrealized) opportunity for payments. The emerging 'gene revolution' is re-sparking interest in conservation payment schemes. Examples are emerging of community compensation to stewards of wild habitats providing medicinal plants considered critical to local health. Bio-prospecting could develop new modalities still not identified that would overcome these barriers.

Expanding public payments for biodiversity services. As described above, government agencies responsible for wildlife conservation in most developed and some developing countries have devised a wide range of CRES initiatives to pay private landowners directly for habitat and (mainly endangered) species conservation. 'Best practice' design of public conservation payments are currently shifting to be more targeted on high-conservation-value sites, rather than standard payments to all participants.

Today these impact a very small proportion of land area, but could expand significantly in countries with high current farm subsidies, as they transfer from commodity payments to the 'green window' approaches more consistent with present World Trade Organization rules. Because these often shift funding away from traditional subsidy recipients, political factors will determine how widespread their adoption is. Recent challenges even to 'green window' payments have been raised by countries with low overall farm subsidies (Australia, Canada etc.), as a restraint of trade. The outcome of these political debates will influence the scope and scale of farm bills and public procurement from green landscape certification as sources of finance for biodiversity

CRES. The extent to which low-income producers will benefit from these policies is an open question.

Public procurement policies by municipalities, countries, states and national governments are increasingly used to promote eco-certified products (e.g., for schools, hospitals, prisons, government building construction). In a few cases, these are being designed explicitly to be pro-poor.

Increasing business responsibility for biodiversity conservation. Regulation has been the principal policy instrument used to limit damage to biodiversity from industrial, mining, oil and gas, infrastructure and real estate development, usually through environmental impact assessment processes. But even with 'best practice' such developments commonly have a large negative impact on biodiversity. Public and stockholder pressure for corporate environmental sustainability and 'license to operate', as well as businesses seeking to benefit from green branding, are promoting much more aggressive responses. One is the development of voluntary 'biodiversity-neutral' or 'footprint-neutral' (Global Footprint Network 2006) corporate policies which actively commit the company to offset unavoidable biodiversity loss, by investing in biodiversity protection or restoration in high-biodiversity-priority sites. Companies with such policies now include Beyond Petroleum, Chevron Texaco, Smithsonian, among others. The Business and Biodiversity Offset Project (BBOP) has engaged nearly a dozen companies in developing and testing methods for rigorous biodiversity offsets, and formalizing such action in policy.

Forty-one international banks have committed to the Equator Principles, which is likely to raise the level of interest in market-like mechanisms for companies to comply with principles for biodiversity conservation. The extent to which these will explicitly incorporate poverty concerns depends upon the international standards that develop for design. In addition to voluntary offsets, biodiversity offsets have been incorporated into development regulations in at least five countries[13].

Bundling biodiversity into CRES for other services. One way to generate financing for certain types of biodiversity conservation is to integrate non-use-value biodiversity objectives into CRES for other ecosystem services that have provide financially valuable use values. Native wetlands and riparian area biodiversity can potentially be protected through watershed protection payments; natural forest biodiversity can be protected through payments for carbon emission offsets or storage or smoke pollution reduction (from forest fires). There are currently major difficulties 'bundling' services in this way, because issues of additionality have not been resolved in these young markets, and most CRES systems perversely reward historical 'bad actors' rather than those who have provided good stewardship. Without such bundling, it is unlikely that CRES will provide a sufficiently high incentive for resource investment and/or land use change, so resolution of this problem is important. Critical intervention points for pro-poor, pro-biodiversity CRES are to ensure such 'bundling' is fully incorporated in new CRES systems, and that eligible land uses for biodiversity conservation recognize use and harvest rights critical to the poor.

Biodiversity certification in product markets. The international conservation community has historically viewed agriculture as a conservation threat, but is now

[13] US, Canada, EU, Brazil and Australia

beginning to identify opportunities to conserve biodiversity in agricultural systems in and around protected areas and other high-biodiversity areas. Programs such as the World Bank's Regional Integrated Silvopastoral Ecosystem Management Project (RISEMP) in Costa Rica, Nicaragua, and Colombia are demonstrating the potential to use CRES to finance smallholders' transition to agricultural practices that are simultaneously more productive, more profitable, and better for native biodiversity (Pagiola et al. 2004). Eco-certified coffee and cocoa production for a number of international companies (e.g., Green Mountain Coffee, Starbucks) have set targets for sourcing at least a portion of their supply from low-income products, with explicit poverty reduction objectives.

Currently, eco-certification systems provide a growing revenue stream to farmers in developing countries. Consumer-driven markets for certified agricultural products are sometimes, but not always, a form of CRES. That is, while some certified labels are intended primarily to capture consumers' willingness to pay for environmental protection, others appeal more to those interested in personal health or social justice. There is some consumer confusion in the marketplace with multiple labels, and many changes can be anticipated.

There are some constraints for eco-certification that will need to be addressed for continued large-scale growth. First, the assumed link between farm practices required by certification systems and the purported environmental benefits (especially biodiversity benefits) may be absent (Bowman-Hicks, pers. comm. 2005). For example, production of organic crops on large, mechanized farms may deliver little biodiversity benefit, especially compared with small-scale rustic production systems that are not certified. Efforts now underway by the Rainforest Alliance and others to remedy this situation by developing certification standards that are more rigorously linked to conservation outcomes are a critical step in solidifying eco-certification as a valid CRES modality.

Also biodiversity conservation is usually strongly dependent on scale and thresholds, which may put smallholders at a disadvantage for selling biodiversity conservation services unless they are able to collaborate together with nearby land stewards to create ecologically meaningful blocks of habitat. Efforts such as the Talamanca Initiative in Costa Rica and Panama are developing a strategy of 'horizontal integration' to enable small-scale producers to enter certified markets requiring large and continuous, high-quality supply (Vargas 2007). But there are generally significant barriers for small-scale producers and communities to enter certified markets. Factors include the use of standards with little local relevance, the high cost of certifiers, and the high cost of monitoring, other costs for small organizations, and the lack of premiums sufficient to cover these costs (Molnar et al. 2005).

3.4 Processes Affecting CRES for Landscape Beauty and Recreation

The evolution of CRES for landscape beauty and recreation are likely to be affected by several factors: supply chain development, evolution of buyer preferences, and impacts of rising energy costs on nature tourism.

Supply chain development. Although payments for landscape beauty and recreational use are perhaps the oldest environmental service markets, in many respects they are poorly developed (Landell-Mills & Porras 2002). A major reason is that, historically, the ecotourism 'supply chain' has disfavored land stewards while allowing tour operators,

concessionaires, and hospitality businesses to capture tourists' willingness to pay for recreational and aesthetic amenities. This situation has begun to change, but the continued provision of tourist and recreational environmental services in national parks for free or well below market value undermines the ability of private land stewards to demand payments.

Evolving buyer preferences. Given the vicissitudes of the global tourism industry – driven by factors such as the state of the global economy, the price of air transport, and the perceived state of international security – markets for tourism and recreation services may prove to be the most fickle of any of the major ecosystem service markets. Furthermore, the demand for such services is usually based less in scientific reality than in the preferences of tourists for a particular aesthetic or recreational experience. The changeability of such preferences implies a fluidity of demand for particular tourism and recreational services.

Increased understanding of the potential negative impacts of tourism and protected areas on local communities – combined with growing influence of local communities in many areas – is contributing to a trend toward increased compensation and establishment of cooperative revenue-sharing agreements between park managers and local communities.

But the preferences of tourists themselves have a significant effect on the extent to which tourism- and recreation-related CRES are likely to be pro-poor. For many ecotourists, meaningful interaction with local people (or 'ethnotourism') is considered highly desirable, implying that there is economic value to the local presence of rural and indigenous communities practicing traditional lifestyles. On the other hand, Landell-Mills and Porras (2002:168) argue that "local communities are frequently viewed to be detracting value from nature-based holidays." In such situations, even if local landowners can capture a portion of tourism revenues, tourist demands that they become 'invisible' components of the landscape may undermine their livelihood strategies. In places like Africa, increased international demand for tourism seems likely to result in increased incentives for conservation of Africa's scenery and wildlife that are attractive to tourists.

Cost of energy. A high proportion of the cost of nature tourism is for transport to reach the remote, rural sites where the benefits of landscape beauty and recreation in nature can be found. Rising energy prices on patterns of nature and eco-tourism mean that the communities potentially benefitting from CRES for this ecosystem service may be mainly in the most unique settings, or those that can rely more on local and nationally-based clients.

3.5 Processes Affecting CRES for Watershed Protection Services

New opportunities for CRES for watershed protection will be affected by a number of key factors, including the evolving regulatory environment, the institutional frameworks emerging for landscape and watershed management, and the evolving science of watershed management.

Evolving regulatory environment. An important policy question is the extent to which the development of watershed CRES will be affected or driven by regulatory changes. In the United States and Australia, for example, trading schemes based around water quality

and salinity, respectively, have created demand for ecosystem services and spurred the creation of markets for such services. It remains to be seen whether some developing countries will eventually enact similar regulations. On the other hand, command and control regulations can hinder the formation of ecosystem service markets: to the extent that governments can successfully regulate problematic environmental actions such as deforestation, prospective sellers of ecosystem services will have less leverage to command a price for voluntarily acting as responsible land stewards.

Particularly in Asia, water pollution from industries and urban areas causing negative impacts downstream and actually limiting economic development. This has been a major issue and efforts to regulate the problem could become a driver for CRES.

Evolving institutional framework for landscape and watershed management. After trying out many different institution models for planning and protection of watersheds that span different political boundaries, institutional innovations have been identified that facilitate participatory multi-stakeholder planning and action (Swallow et al. 2005). Collective action across rural organizations is also developing in some places that can enable aggregating producers across heterogeneous contributions, with application for CRES. The further development and adaptation of these models will greatly affect the potential for organizing pro-poor PES. Arrangements are further complicated by new international arrangements for trans-boundary watershed management.

Evolving science of watershed management. There is, as yet, inadequate scientific information linking specific land use and land management practices to the resulting watershed protection services. To the extent that this information has been developed, it is often context-specific and non-transferable to distant watersheds. Furthermore, different watershed services may demand different management actions, thus creating conflicting land use mandates; for example, reforestation efforts may improve water quality but diminish water quantity to downstream users (Van Noordwijk 2005; Pagiola et al. 2002).

One barrier to this conservation approach, however, is that many governments have serious revenue shortfalls caused by ineffective tax systems or depressed economies. Burgeoning social welfare demands compete with public sector investments in protected areas and natural resources management; the latter have actually declined in many countries during the past decade. A related problem is that using general revenues may not be equitable since some people and businesses use much more water than others do. In the next 10-20 years, growth in payments by state and municipal governments may be more significant than from federal funds.

3.6 Processes Affecting CRES for Carbon Sequestration and Storage

Different factors will be shaping the evolution of regulatory and voluntary carbon markets related to land use and management.

Evolution of regulated markets. Countries benefiting from the CDM so far are large middle-income developing countries, while the majority in the developing world has still to take part. Many 'Designated Operational Entities' and Designated National Authorities (of the CDM) in Latin America have recently carried out workshops and

training to encourage and facilitate the use of the CDM mechanism in their countries. These Designated Operational Entities approve country projects based on their own definition of sustainable development, thus, these agencies will play a role in promoting and facilitating pro-poor CRES- within the confines of the CDM.

It appears that forestry emission reduction projects will continue to be restricted from participating in offsetting Green House Gas (GHG) emissions associated with Kyoto Protocol compliance targets through 2012 - the first commitment period, within member countries. This is reflected in the World Bank's 2006 Report with LULUCF projects accounting for only 1% of the 2005 traded volumes (Capoor and Ambrosi 2006).

Nonetheless, within the Kyoto framework for the regulatory carbon market, avoided deforestation as a source of carbon credits is currently being revisited, which would greatly increase the potential participation of pro-poor transactions of the CDM market. Proposals from countries have been received by the UNFCCC and continue to be discussed in meetings of the Subsidiary Body for Scientific and Technical Advice for possible inclusion into the 2nd phase of Kyoto, post 2012. The main reason it was not included in the first commitment phase related to methodological issues of leakage (changes in GHG emissions in locations outside the project boundary) and permanence. Many countries and organizations are proposing mechanisms to address how to include carbon credits from avoided deforestation in these countries.

Subsequent to numerous pressures to include LULUCF credits in the European Union Emission Trading Scheme (EU ETS), a Technical Workshop on the matter was held at the British Council co-chaired by 4 European governments in early 2006. Efforts to influence the European Commission and member states regarding the inclusion of LULUCF carbon in its second phase are estimated to take between 1-3 years[14]. The inability of Carbon Emissions Rights from forestry to be traded in the EU ETS remains a powerful disincentive to the broader growth and development of a forest based carbon market.

In addition, some broader re-thinking is also afoot by developed countries regarding the potential role of forestry offsets in national markets. On the one hand, Costa Rica announced that it will embark on a country level Carbon neutral, which will involve "cultivating a carbon certificate market that aims to not only boost carbon capture and storage in the nation's forests, but also help maintain their scenic beauty" (Vargas 2007). Two opposing examples are Canada and the United States where in order to direct investment to local domestic producers, there are limits under discussion to using out of country LULUCF offsets, for example in some Canadian provinces, and in the RGGI and other western states carbon markets. Thus, as buyers from developed countries come to be more regulated by domestic markets with requirements to meet offsets via domestic markets, the potential for these buyers to look southwards to carbon offset projects in developing countries will be lessened.

Evolution of the Voluntary Carbon Market. The advent of new players, coupled with strong climate-oriented marketing efforts by environmental organizations indicates that the voluntary market will grow considerably in 2006. The Chicago Climate Exchange, which allows forestry offsets from U.S., Mexican and Brazilian carbon sequestration projects, including reforestation, afforestation or conservation projects, is expected to

[14] Personal communication with Toby Janson-Smith, Climate Community and Biodiversity Alliance.

evolve and grow faster than others (Biello 2005). Nonetheless, the voluntary carbon market is rapidly becoming synonymous with the market for renewable energy credits (RECs) – allowances that are created by wind, solar, biomass, and other renewable generation in the United States. In fact, as improvements in technology occur, increases in the efficiency of reducing emissions in cheaper ways will tend to make credits sourced from LULUCF become less competitive. Nonetheless, in the meanwhile, forestry carbon's immediate sequestration potential is very attractive.

Policy processes and legislative adjustments being made in the voluntary market and in developing countries facilitate and promote purchases and transactions in LULUCF carbon credits. As an example, the Mexican Carbon Biodiversity Ecosystem Service Program (CABSA) will undergo considerable changes starting 2008. The World Bank provided the Mexican government with a loan alongside a GEF project received by the Mexican government to sponsor the development of an integrated PES program that blends the hydrological Program and CABSA program into one entity. The funding that the program provides to participants will still come from the government via federal allocations as well as the World Bank loan and grant[15].

Another important set of processes underway involve the work to lend more credibility, transparency and uniformity in the methodologies of creating land based carbon credits. Related to this, continued work on standards for certifying multiple benefit carbon projects for both the voluntary and regulated carbon markets exists. Two examples that include or are in fact aimed at ensuring high quality forest carbon offsets are the Climate, Community and Biodiversity Alliance standards, and the World Resources Institute (WRI)/World Business Council for Sustainable Development standards. In addition, a new set of standards promoted by the International Emissions Trading Association (IETA) and the Climate Group will establish a tradable Voluntary Carbon Unit to promote the voluntary carbon market. This standard is currently only considering the inclusion of carbon emission reduction credits sourced from LULUCF projects and activities, so limitations on pro-poor land use based carbon sales would continue if these activities are not included. The Gold Standard, being devised by the World Wildlife Fund, seeks to define criteria for bolstering the sustainable development outcomes/potentials of the carbon sales, applicable to both the voluntary and regulatory markets. The Gold Standard is developing a criteria focusing on the pro-poor potential of the Certified Emission Reductions (CER) and Voluntary Emission Reductions (VER) it certifies, but again in this case, forestry based carbon activities are not included.

4. CRES with Promising Potential for the Poor and for Ecosystems

This section explores the potential of CRES to benefit the poor as well as ecosystems managed by the poor over the next 20 years. A key aspect of CRES is that they must make payments contingent on the verifiable delivery of the ecosystem services contracted, whether or not low-income producers or consumers are involved (Wunder

[15] Personal Interview of Elizabeth Shapiro on research for her Dissertation, "Issues of Equity, Discourse of Value in National Payment for Environmental Service Programs of Mexico," UC Berkeley.

2005). Pagiola and colleagues (2005) and others have argued persuasively that CRES programs must be designed with the principal aim of conserving ecosystem services in a cost-effective manner. While it is often desirable to reduce barriers or facilitate participation by poor people, if CRES programs target payments based on the location of poor people rather than on the distribution of lands providing valuable ecosystem services, then the entire premise of CRES as a contingent contract will be undermined.

4.1 General Market Conditions for Pro-Poor Impacts

Poor people will be able to benefit from CRES only when:

1) They own or manage land or resources that provide ecosystem services;
2) They are capable of managing this land to provide ecosystem services;
3) Mechanisms are in place to measure and verify the provision of ecosystem services so that poor people can receive compensation; and
4) Transaction costs associated with aggregating PES for many small-scale resource stewards can be effectively managed.

In many regions of the world, poor people own or control many or most of the key ecosystem resources. For example, in Indonesia, 70% of the country is classified as forest domain and managed for watershed benefits, and this area is home to 50 million poor people. In other areas, though, it is large or wealthy landowners who control the most ecologically valuable lands. For example, in many cases the principal stewards of upper watershed areas are large-scale ranchers or cash crop producers, or the highest-value watershed resources are wetlands owned by wealthy farmers in the valleys. To identify the specific areas where poor people stand to benefit most from CRES will require region-by-region overlays of poverty with lands providing key ecosystem services.

Of course, even where poor people control ecologically valuable lands and are participants in CRES programs, it is not certain that ecosystems will benefit. This is because management for certain ecosystem services may actually diminish other ecosystem services or overall environmental quality. Payments made for narrowly defined watershed or carbon sequestration services may ignore or even undermine broader ecosystem health, for example where carbon payments are made for tree plantations of non-native and invasive species. Management regimes put in place to justify payments for watershed services benefiting lowland irrigated farming may threaten water flows for wildlife habitat. However, these issues can be prevented through the design of CRES to consider the impact on overall ecological functioning, not just on a single ecosystem service.

All of these markets have the potential to involve intermediaries who are not profit-maximizers, and many such organizations are already taking a lead in helping to create knowledge and understanding about the mechanisms and modalities through which pro-poor communities can participate in the carbon market. Witness efforts like the Katoomba Group networks in Africa and Tropical America[16] that pull together multi-sectoral organizations focused on this work, and Forest Trends[17] Communities and Markets program that is dedicated to community and pro-poor education and capacity

[16] www.katoombagroup.org
[17] www.forest-trends.org

building materials, and even a Social Carbon Fund[18] that brings together a development NGO, investor and retailer in Brazil. Certainly, the Tanzania International Small Groups Tree Planting Programme's (TIST) non-profit arm is another example of the type of support being directed at this market segment, helping to efficiently channel development assistance money and funds from sale of carbon to groups on the ground.

Finally, it is important to be realistic about the relative contribution of CRES to the livelihood strategies of low-income people in developing countries. While payment amounts vary considerably by the service being provided and the amount of land being managed, in most cases, CRES alone will not lift poor people out of poverty (Graff-Zivin & Lipper 2006). Instead, it can provide an important source of income to diversify or supplement household livelihood strategies – especially since CRES income may be more reliable than income from agriculture or forest products. In addition, CRES can help finance a transition to more sustainable, diversified resource management activities by providing working capital for investment or by creating incentives for specific practices – from tree planting to water quality enhancement to replenishment of soil organic matter – that will ultimately improve land productivity as well as environmental quality (Pagiola et al. 2004; Scherr et al. 2007b).

4.2 Evaluating Potential for Pro-Poor CRES

To identify which of the CRES market sectors described in Section 2 will be of greatest importance for the poor requires overlaying an assessment of total demand for ecosystem services in each market sector with key criteria for pro-poor market design. Table 4 (see Annex) provides the authors' assessment of the overall potential for different CRES markets to benefit the poor (and to benefit ecosystems managed by the poor). These assessments are based on the following criteria and are explained further for each market segment below.

1) The overall anticipated scale of buyer demand in each market segment, based on current market size as described in Section 2 and on growth trends and potential as described in Section 3;
2) The proportion of potential buyers requiring or preferring ecosystem services from resources owned or managed by the poor; and
3) The proportion of potential buyers with a preference for social co-benefits.

Table 4 (in Annex) does not present predictions; rather they reflect the *potential*, if political and economic actions to shape CRES to benefit the poor are largely successful. Some of the key political and economic factors that will affect market development and impact on the poor are described in Section 3. Issue paper 2 of the CES Scoping Study (ICRAF Working paper no. 37) provides additional discussion of criteria for pro-poor CRES markets.

[18] www.socialcarbon.org

4.3 Pro-Poor Potentials for Biodiversity CRES

Payments to poor people for biodiversity conservation could become a major segment of the CRES market, on a par with or even exceeding the potentially large market for carbon sequestration. One major driver is the fact that poor people occupy many of the most biodiverse and most threatened lands in Latin America, Africa, and Asia (Molnar et al. 2005).

Public payments to farmers and ranchers for biodiversity conservation will likely increase, with the potential to benefit low-income and indigenous communities in high-value biodiversity areas and in degraded ecosystems (Scherr et al. 2007a). Regulated markets in the form of wetland banks and conservation banks with credits traded on open markets are not anticipated to be large sources of income for low-income groups, in part because only high-income and middle-income countries in areas with good general market development will likely establish these, and even where they do (e.g., in South Africa or Mexico), few participants are likely to be poor. However, current efforts underway to institutionalize mandatory or voluntary biodiversity offsets for large development projects, if successful, could bring large amounts of funds to this market (Ten Kate et al. 2004). Because many such projects occur in low-income regions of developing countries, poor people are the logical beneficiaries. High visibility and the right standards could encourage projects with high social co-benefits.

The philanthropic market for biodiversity services appears poised for growth and, again, the presence of low-income populations in areas of high conservation value suggests that the poor could benefit significantly. Driving this growth, in part, is the trend of conservation organizations to move beyond strictly protected areas as a conservation strategy to focus on ecosystem or ecoregions, including privately managed agricultural areas, grasslands, and forests. Large conservation organizations such as WWF are explicitly promoting the development of markets for biodiversity services, while The Nature Conservancy and Conservation International both have experience using conservation easements and conservation concessions as a way of compensating landowners in exchange for providing conservation-friendly management of private lands.

Eco-certified products, particularly for agriculture and non-timber forest products, are likely to increase very significantly over the next two decades, although dominated by non-poor producers. Among the reasons for this are the initial investments required to comply with certification requirements. Additionally, certification requires connecting to markets, which is difficult for small producers in remote locations without adequate access to roads or communication technology. Eco-certification does not necessarily have to bypass low-income producers, but in order to make sure it does not, intermediaries or buyers on the other end of the spectrum must particularly reach out to those segments of the population.

We can expect to see a wide range of models for CRES in biodiversity, including many non-monetary ones in which compensation is in the form of more secure land and resource rights, provision of social services, etc.

4.4 Pro-Poor Potentials for Landscape Beauty and Recreation CRES

Payments to low-income communities for landscape beauty and recreation are likely to be geographically limited to those living in or adjacent to areas of high tourist attraction. The anticipated size of these markets is uncertain, there is potential for these to be integrated into park financing systems and new eco-tourism approaches. The most important buyers will be private tourist operators and related businesses, either directly or in aggregated groups working in a particular area of high scenic beauty. Private recreational hunters, fishermen and private park visitors will also likely become buyers of landscape beauty and recreation services. There are many models now for using public park visitor fees to benefit community groups who protect landscape and recreational values, and these could become significant. The overall size of market segments involving philanthropic and eco-certified product buyers seems likely to remain small, with an even smaller proportion for low-income communities, and regulated cap-and-trade markets are not anticipated.

There could potentially be negative impacts from private PES if flows of ecosystem services divert to private benefits at the expense of other social groups and of natural biodiversity. CRES for landscape beauty and recreation often include non-monetary compensation to communities, such as provision of services, but there may be difficulties in maintaining the conditional contract with private sector, for profit buyers over time without monetary payments.

4.5 Pro-Poor Potentials for Watershed Protection CRES

While the main market segments of watershed protection services – water quality and water flow, regulation – were analyzed separately for this exercise, the findings were similar. As discussed above, the location specificity of most watershed services is an important factor, and is likely to limit the overall scope of pro-poor watershed CRES: unlike carbon sequestration services, water-related services are not fungible, and are usually dependent on land use practices in a particular watershed or a part of a watershed. These critical watershed areas may amount to only a small portion of the land area in a region, and may or may not coincide with areas of high poverty. Chomitz et al. (2006), using geographic information system overlays, found that large areas of upland watersheds in specific countries in Latin America (e.g., Guatemala) did indeed coincide with high rates of poverty. Across Indonesia, 70% of the country – home to 50 million poor people – is classified as protected forest domain, largely for watershed protection. Thus, both public and private payments for water quality and water quantity, have the potential to evolve into significant areas for pro-poor CRES.

The most promising watershed protection market segments are expected to be government buyers and the private voluntary market. These segments have the flexibility to work with low-income communities and are more likely to seek social co-benefits. Wherever water pollution, water scarcity, or flood threats originate with low-income communities, these communities may be targets for CRES. The number of such communities could be very large given anticipated watershed-related problems, especially in densely populated dry countries like India and China.

Philanthropic buyers will not likely be much involved in watershed markets, other than by subsidizing low-income beneficiaries to secure watershed services. Even within 20 years, few low-income countries or low-income regions of middle-income countries will likely have the institutional resources to set up and manage regulated markets for water flow or quality, and none exist yet in developed countries for flood control. We may see the development of some eco-certified niche products that certify for water quality, but it is likely that such product markets will not be large and most producers will not be poor.

4.6 Pro-Poor Potentials for Carbon Sequestration and Storage

Of all CRES, the one with the greatest *potential* to support low-income rural landowners and managers is the carbon market, in particular the voluntary market and public government agency payments to carbon producers. Nonetheless, the need for high quality standardized forest carbon emissions reductions will rely on concerted efforts to pull together solid methodological standards. The window of opportunity is short for transforming carbon deals from transactions relying on trust between partners and institutions and project or location specific criteria to establishing the needed legal, scientific and regulatory frameworks for the transactions to stand alone solidly. The global forest carbon market is still small and fragile given the methodological and institutional complexities involved, and dedicated efforts to ensure a robust set of institutions and market rules that guarantees the needs of buyers and sellers, and society as a whole, are critical.

Carbon-focused projects are more likely to involve monetary, rather than non-monetary compensation. Typically, these payments won't get people out of poverty, but using payment to finance transition to more sustainable, diversified resource management activities are the key.

Forestry based carbon emissions from developing countries are significant: from 18% to 25% of global emissions of carbon from all sources (IPCC 2007, Stern Report 2006). As such, the incentive to create a mechanism that avoids this amount of carbon being put into the atmosphere yearly is overwhelming. In addition, as noted by the World Bank's Biocarbon Fund "many countries, and especially the poorest ones, do not have the energy or industrial infrastructure that would allow them to benefit from the CDM in a significant way. For many, and in particular large rural populations that are the home of so many of the poor, sinks are the only significant avenue for participating in the carbon market" (www.carbonfinance.org).

While the size of the voluntary market overall is likely to be much smaller than for the regulatory carbon markets (i.e. Kyoto CDM, EU Trading Scheme), the LULUCF component could be equally or more significant. This is because voluntary buyers (including philanthropic buyers) are more likely to be interested in demonstrating positive social co-benefits, and public sector buyers can choose to invest in low-income areas and to utilize carbon payments to restore degraded lands and forests on a large scale. The great advantage of carbon markets is that there are no geographic limits or minimum thresholds: a ton of carbon sequestered by a poor farmer hundreds of miles from any road has exactly the same value as a ton produced by a commercial plantation set-aside near the capital city.

Furthermore, increasing carbon stocks in farm soils and vegetation can often be accomplished while simultaneously increasing farm productivity. Such synergies are particularly valuable for smallholders in developing countries where diversification and risk-spreading are important components of a livelihood strategy.

The Mexican CABSA program was preferentially targeted to marginalized forest owners (of which 80% are community based landowners), so the pro-poor potential of the program is promising. Applicants need to follow monitoring and implementation methodologies of the CDM, which are not published in languages other than English and also represent very high transaction costs in some cases, limiting the application to the poor. Giving money directly to technical support for preparing high quality carbon projects is quite novel. It is criticized though, for not providing support for finding markets to sell the carbon credits in, even though NGOs are playing such a role.

The regulatory market segment is not considered very promising in terms of the short-term growth potential for developing countries and communities of poor carbon offset sellers given the highly complex, costly and demanding procedures required to participate and deliver carbon credits to the market. Even though small scale projects can benefit from simplified modalities and procedures established by the CDM, scientific complexity, insufficient data and difficulties in monitoring LULUCF projects has led to criticism of the CDM mechanism. The regulated markets could still involve a large number of low-income suppliers if the 'rules of the game' explicitly encourage that. Since nationally based entities of the CDM guide the development and approval of country based projects, their ability to integrate the national and local sustainable development goals into their activities and mandates can result in more (or less) pro-poor outcomes. Few eco-certified projects today explicitly value carbon emission offsets, but it is likely that some will do so in the future.

5. Research Questions on Patterns of CRES Development and Implications for Poverty Alleviation and Ecosystem Health

The analysis in section 4 concluded that there are indeed major opportunities for CRES to benefit poor communities in the developing world, particularly in certain market segments. For CRES to be an effective tool for poverty reduction and alleviation, low-income providers of ecosystem services and low-income groups dependent on ecosystem service, must have access to CRES programs, be capable of supplying sustainable flow of services, and be able to negotiate favorable terms of CRES agreements/contracts. Such contracts would ideally enhance the financial and social value of their resources; leverage positive land use changes, bundle activities providing complementary ecosystem services with other productive activities, and focus on generating co-benefits and reducing livelihood risks.

To evaluate which CRES market segments will have the potential to generate such outcomes at local, national and international scales, and understanding how to shape such outcomes, requires answers to a number of research questions. These can be categorized as relating to evolving patterns of economic 'demand' for ecosystem services,

of evolving 'supply', and of evolving market institutions for CRES (including streamlining of transaction costs and financing).

5.1 Evolving Patterns of Economic Demand for Ecosystem Services

1) More in-depth analysis is needed of the potential for conservation finance from diverse sources, for key ecosystems and ecosystem services, over the next 20 years. What proportion of this is likely to be derived from CRES? In what types of areas and for what resources will CRES be preferred as an ecosystem strategy rather than other forms of management or conservation financing?

2) How profitable will participation in CRES be for low-income rural land stewards? What level of prices can be expected to evolve over the next 20 years, in relation to other income sources? How large will be the premiums placed on eco-certified products? To what extent will the poor be able to participate in eco-certified product markets?

3) What will be the incentives for CRES to develop pro-poor business models? What social marketing can be done to encourage businesses and consumers to offset their ecological footprints? What are different types of buyers' motivations to seek social co-benefits? Will urban demand for environmental services depend more on market forces or political processes?

5.2 Evolving Patterns of Supply of Ecosystem Services

1) What is the scientific evidence on how resource management approaches affect hydrology, biodiversity and carbon sequestration in different ecosystem conditions?
   To what extent can ecosystem services be produced in mixed landscape mosaics, and
   thus be part of a portfolio of income generating and ecosystem health activities for rural communities? How can scientifically credible offsets for carbon through avoided deforestation be designed? How can we better define and measure the services being paid for?

2) How can targeting of the poor best be done in public and private sector CRES? Are precedents being set that enable or provide barriers to participation of the poor?

3) What are the potential income and benefit flows from production of ecosystem services relative to products (esp. crops/livestock)?

4) How can countries monitor progress in achieving ecosystem goods and services?

5.3 Evolving Institutions for CRES Markets

1) For eco-certification, how can we fill gaps in the value chain for stewardship by the poor?

2) For private payments, what intermediation and aggregation of buyers and sellers can
occur? To what extent can organizations of poor producers engage in these activities for themselves? What are the priority capacity building initiatives that should be funded?

3) What institutional arrangements can significantly reduce transaction costs for low- income communities to supply large-scale private and public buyers? How can demand from private sector buyers of ecosystem services be aggregated and intermediated in ways that facilitate transactions with low-income providers?

4) Through what mechanisms can we track and encourage dialogue on the positive and negative impacts of CRES on low-income communities, as CRES evolve?

5) What institutional options can be developed to finance low-income producers to undertake investments that will produce ecosystem services paid for upon delivery?

6. References

Agius, J. 2001. Biodiversity Credits: Creating Missing Markets for Biodiversity. *Environmental and Planning Law Journal.* 18(5): 481-504

Alix-Garcia, J., De Janvry, A., Sadoulet, E., and Torres, J.M. 2005. An assessment of Mexico's payment for environmental services program. Unpublished paper prepared for FAO by UC Berkeley and the Centre for Research and Teaching of Economics, Mexico.

Bayon, R., Hawn, A., and Hamilton, K. 2007. *Voluntary Carbon Markets.* Published by Earthscan Publications, USA.

Biello, D. May 2, 2006. *Eight is not Enough.* Ecosystem Marketplace Feature Article http://ecosystemmarketplace.com/pages/article.news.php?component_id=4332&component_version_id=6264&language_id=12

Biello, D. September 14, 2005. *Speaking for the Trees, Voluntary Markets Help Expand the Reach of Climate Efforts*. Published on Ecosystem Marketplace September 14, 2005, and downloaded May 8th http://ecosystemmarketplace.com/pages/article.news.php?component_id=3842&component_version_id=5516&language_id=12

Bond, I. 2005. Payments for Watershed Services. Presentation at 'Building Foundations for Pro-Poor Ecosystem Services in Africa, Eighth Meeting of the Katoomba Group.' Jinja Town, Uganda, September 2005.

Bowman-Hicks, F. 2005. Personal communication. April 2005.

Brand, D. 2002. Australia. *In*: Pagiola, S., Bishop, J., and Landell-Mills, N. eds. 2002. *Selling forest environmental services: market-based mechanisms for conservation and development.* Earthscan, London.

Capoor, K., and Ambrosi, P. 2006. *State and Trends of the Carbon Market 2006*. World Bank, Washington, DC.

Chomitz, K. M., Brenes, E., and Constantino, L. 1998. Financing environmental services: The Costa Rican experience and its implications. *Science of the Total Environment* 240: 157–169.

Chomitz, K. M, Buys, P., and De Luca, G. 2006. *At Loggerheads? Agricultural Expansion, Poverty Reduction, and Environment in the Tropical Forests.* World Bank Publications, Washington DC.

Clay, E. 2002. Food Security: Concepts and Measurement, Paper for FAO Expert Consultation on Trade and Food Security: Conceptualising the Linkages Rome, 11-12 July 2002. Published as Chapter 2 of Trade Reforms and Food Security: conceptualising the linkages. Rome: FAO, 2003.

Dannaker, C. 2006. Should Temporary CERs be Included in the EU ETS Linking Directive? and other questions concerning the potential demand for CDM Forestry CERs. A study by EcoSecurities Consult. Accessed May 06 at http://climate-standards.org/images/pdf/EcoSecurities-demand-survey-March06.pdf

Echavarria, M. and Lochman, L. 1999. *Policy mechanisms for watershed conservation: Case studies.* Arlington, Virginia: The Nature Conservancy.

Echavarria, M., Vogel, J., Albán, M., and Meneses. F. 2004. *The impacts of payments for watershed services in Ecuador. Emerging lessons from Pimampiro and Cuenca.* International Institute for Environment and Development, London.

Ecosystem Marketplace. 2006. http://ecosystemmarketplace.com/

Forest Trends. 2006. *Institutionalizing Payments for Ecosystem Services.* Forest Trends, Washington DC.

Gelderblom, C., and van Wilgen, B. 2000. South Africa's working for water program. Paper prepared for World Resources Institute's Critical Flows Project by Council for Scientific and Industrial Research,Cape Town.

Global Footprint Network 2006. www.globalfootprintnetwork.org. Visited March 22, 2007.

Graff-Zivin, J., and Lipper, L. 2006. Poverty, risk and the supply of soil Carbon sequestration. Paper Submitted to Int'l Conference on Economics of Poverty, Environment and Natural Resource Use. 17-19 May 2006, Wageningen University.

Government of Costa Rica, Ministry of the Environment and Energy, National Forestry Financing Fund, Inter American Institute for Cooperation on Agriculture. 2005. Country-led Initiative on "Innovative financial mechanisms: searching for viable alternatives to secure basis for the financial sustainability of forests". Summary Report, San José, Costa Rica, March 29 – April 1.

Hanley, M. April 2006. Hitting the target: NSW Producers meet Compliance Deadline in Trading Scheme. Ecosystem marketplace Feature Article at http://ecosystemmarketplace.com/pages/article.news.php?component_id=4294&component_version_id=6185&language_id=12

Harris, E. 2006. The Voluntary Retail Carbon Market: A Review and Analysis of the Current Market and Outlook. Master's thesis. The Imperial College, London.

IFOAM. 2002. *Organic Agriculture for Food Security in Africa.* International Federation of Organic Agriculture Movements (IFOAM). www.ifoam.org/organic_facts/food/pdfs/Africa-Food-Security.pdf

Krolik, T. May. 2006. The Argentine Carbon Fund helps Developers Dance the Dance. Ecosystem Feature Article accessed at http://ecosystemmarketplace.com/pages/article.news.php?component_id=4371&component_version_id=6302&language_id=12

Katoomba Group. Ecosystem Market Matrix. Washington, DC, vers. 19.

Katoomba Group. 2006. Katoomba Group website, www.katoombagroup.org. Accessed April 2006.

Landell-Mills, N., and Porras, I.T. 2002. Silver bullet or fools' gold? A global review of markets for forest environmental services and their impacts on the poor. International Institute for Environmental and Development. London, UK

McNeely, J.A. and Scherr. S.J. 2003. *Ecoagriculture: Strategies to Feed the World and Save Wild Biodiversity.* Island Press, Washington, DC.

Millennium Ecosystem Assessment. 2003. *Ecosystems and Human Well-being: A Framework for Assessment.* Washington, DC: Island Press.

Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being: Synthesis Report.* Washington DC: Island Press.

Molnar, K., and Scherr, S. 2005. *Who Conserves the World's Forests?* Forest Trends and Ecoagriculture Partners, Washington, D.C.

Mulder, I., ten Kate, T., Scherr, S. 2006. Private Sector Demand in Markets for Ecosystem Services: Preliminary Findings. Adapted from full report submitted to the UNDP-GEF project: "Institutionalizing Payments for Ecosystem Services, supplement III. Mobilizing Private Sector Buyers for Ecosystem Services

Pagiola, S., Arcenas, A., and Platais, G. 2005. Can payments for environmental services help reduce poverty? An exploration of the issues and the evidence to date from Latin America. *World Development* 33(2):237-253.

Pagiola, S., Agostini, P., Gobbi, J., de Haan, C., Ibrahim, M., Murgueitio, E., Ramírez, E., Rosales, M., Ruíz, J.P. 2004. *Paying for biodiversity conservation services in agricultural landscapes.* World Bank Environment Department Paper No. 96. World Bank, Washington, DC.

Pagiola, S., Bishop, J., and Landell-Mills, N. eds. 2002. Selling forest environmental services: market-based mechanisms for conservation and development. Earthscan, London.

Pearson, T., Walker, S., and Brown, S. 2005. *Sourcebook for Land Use, Land Use change and Forestry Projects. 2005*. BioCarbon Fund, Winrock International.

Scherr, S.J., Milder, J.C., and Inbar, M. 2007a. Paying Farmers for Biodiversity Services. Chapter 21 *in* S.J. Scherr and J.A. McNeely, eds. *Farming with Nature*. Island Press: Washington, D.C.

Scherr, S.J., Milder, J.C., Lipper, L., and Zurek, M. 2007b. *PES Potentials for Smallholder Agriculture.* Ecoagriculture Partners and FAO, Washington DC.

Scherr, S.J., White, A., and Khare, A. 2004. *For Services Rendered.* International Tropical Timber Organization (ITTO). Washington DC.

Shapiro, EN. (forthcoming) Issues of Equity, Discourse of Value in National Payment for Environmental Service Programs of México. Dissertation, University of California, Berkeley.

Stern, N. 2006. *The Economics of Climate Change - The Stern Review.* Cambridge University Press, Cambridge, U.K.

Swallow B, Meinzen-Dick R and van Noordwijk M. 2005. *Localizing demand and supply of environmental services: interactions with property rights, collective action and the welfare of the poor.* CAPRI Working Paper no. 42, Collective Action and Property Rights Initiative.Washington DC: International Food Policy Research Institute.

Ten Kate, K., Bishop, J., and Bayon, R. 2004. *Biodiversity offsets: views, experience, and the business case.* IUCN, Gland, Switzerland and Cambridge, UK and Insight Investment, London, UK.

Trexler M.C. 2003. The role of the greenhouse gas market in making forestry pay. Unasylva - No. 212 - *Making forestry pay* Vol. 54 2003/1.

Trust for Public Lands. 1997. *Protecting the source: Strategies for watershed protection.* Trust for Public Lands, New York.

United Nations Environment Program and London School of Economics. 2005. Conclusions. High-Level Brainstorming Workshop on Creating Pro-Poor Markets for Ecosystem Services: Identifying a mid-term strategy for a possible plan of action of cooperation. October 11-12. Nairobi, Kenya.

Van Noordwijk, M. *2005. RUPES typology of environmental services worthy of reward.* Bogor, Indonesia: World Agroforestry Centre (ICRAF).

Vargas, A. February 21, 2007. "País quiere ser primera nación con balance neutro de carbono" La Nacion. www.nacion.com/ln_ee/2007/febrero/21/aldea1002694.htm

Waage, S. 2007. Investing in the *Future: An Assesment of Private Sector Demand for Ecosystem Service Business Agreements, a Synthesis of Current Research.* Forest Trends, Washington DC.

White, A., and Martin, A. 2002. *Who Owns the World's Forests?* Forest Trends, Washington DC.

Wunder, S. 2005. *Payments for environmental services: some nuts and bolts.* CIFOR Occasional Paper no. 42, www.cifor.cgiar.org

ANNEX

Table 1. Estimated Size of Payments for Biodiversity Services

Source: Adapted from Ecosystem Market Matrix, version 19. Ecosystem Marketplace, 2006.

Ecosystem Payment Types	**Estimated Current Size of Payments Globally (US$ per annum)**	**Estimated Current Size of Payments in Developing Countries (US$ per annum)**
Regulatory-Driven Species Offsets (including US Conservation Banking)	US$45 million in the US; Program just begun in Australia and possibly similar program in France, size unknown	Unknown how many species offsets are driven by Environmental Impact Assessment (EIA) regulation in developing countries
Land Trusts, Conservation Easements (and expenditures by NGOs for conservation)	US$6,000 million in US alone	Size and use of easements in developing countries unknown. Roughly US$2 billion/yr (McKinsey-WRI-TNC)
Voluntary Biodiversity Offsets (offsets outside the regulatory framework)	US$20 million for just offsets	Probably some 50% of global market
Government Conservation Payments and Biodiversity Offsets	US$3,000 million - just flora and fauna oriented programs (not including water and soil conservation)	Costa Rica: over US$14 Million; Current global expenditures on protected areas are estimated at approximately US$6.5 billion per year

Table 2. Estimated Size of Payments for Watershed Services

Ecosystem Payment Types	Estimated Current Size of Payments Globally (US$ per annum)	Estimated Current Size of Payments in Developing Countries (US$ per annum)
Compliant Water Quality Trading	US$7 million	Size and volume in developing countries unknown, but likely minimal, due to requirements for legislative infrastructure and strict enforcement
Voluntary Private Sector Watershed Management Payments	US$5 million (many public PES are partially private - like Costa Rica ~30% private funds by electric, also Ecuador, public utility revenues)	Costa Rica ~30% private funds by electric, also Ecuador, public utility revenues. ESPH in Costa Rica operates independent of FONAFIFO and invests roughly US$45,000 a year in protecting the watershed
Government Mediated Watershed PES	US$1,000 million (New York City ~US$150 million, WRP US$240 million, EQUIP estimate 50% for water-related ~US$500 million); Mexico program: US$18 million; Costa Rica program: US$5 million; China program: roughly US$4 billion per year	Mexico program: US$18 million; Costa Rica program: US$5 million; China program: US$US 43 billion across 10 years (program apparently has lots of problems); South Africa program: R660 million per year, US$65 million

Source: Adapted from Ecosystem Market Matrix, version 19. Ecosystem Marketplace, 2006

Table 3. Estimated Size of Payments for Carbon Sequestration and Storage

Ecosystem Payment Types	**Estimated Current Size of Payments Globally (US$ per annum)**	**Estimated Current Size of Payments in Developing Countries (US$ per annum)**
Regulatory-Driven Carbon Forestry (e.g. Kyoto, LULUCF)	US$100 million	Majority of investment in developing countries
Voluntary Carbon Forestry	US$15 million	Probably 80% in developing countries
Compliant Carbon Trading	US$1,000 million (just for project-based reductions)	Probably close to 80% of this is in developing countries
Voluntary Carbon Trading	US$60 million	Some 50% of this is spent in developing countries
Renewable Energy Trading	US$155-185 million	NA

Source: Adapted from Ecosystem Market Matrix, version 19. Ecosystem Marketplace, 2006.

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Table 4. Potential for CRES Market Sector to Benefit Poor Ecosystem Service Providers in Developing Countries in 20 Years

	----------Buyer----------				
Compensation for:	**Public sector**	**Private, under regulatory requirement**	**Private, voluntary** (business case, for use values)	**Philanthropic** (non-use values)	**Consumers of eco-certified products**
Carbon (through land use, land use change, and forestry)	XXX	XX	XXX	XX	X
Water Quantity/Flow	XX	X	XX	X	x
Water Quality	XX	x	XX	X	X
Biodiversity Conservation	XX	X	XX	XX	XX
Landscape Beauty or Recreation	XX	0	XX	X	x

* These estimates are not predictions; rather they reflect the *potential* if political and economic actions to shape CRES to benefit the poor are largely successful. See Section 3 for a discussion of key factors influencing the development of pro-poor CRES markets and programs.

XXX – Potentially millions of low-income providers could benefit
XX - Potentially hundreds of thousands of low-income providers could benefit
X - Fewer than 100,000 low-income providers likely to benefit
x - These markets segments likely to develop, but affecting small numbers of low-income providers
0 - These market segments unlikely to develop

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Who we are

The World Agroforestry Centre is the international leader in the science and practice of integrating 'working trees' on small farms and in rural landscapes. We have invigorated the ancient practice of growing trees on farms, using innovative science for development to transform lives and landscapes.

Our vision

Our Vision is an 'Agroforestry Transformation' in the developing world resulting in a massive increase in the use of working trees on working landscapes by smallholder rural households that helps ensure security in food, nutrition, income, health, shelter and energy and a regenerated environment.

Our mission

Our mission is to advance the science and practice of agroforestry to help realize an 'Agroforestry Transformation' throughout the developing world.

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