



The Changing Role of Forests: State of Development of Markets for Ecosystem Services

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Introduction

For over twenty years there have been concerted efforts to reduce the loss and degradation of forests. While some success has been seen in countries like Australia where regulation of land clearing has been effective in reducing conversion rates (WWF, 2009), in other regions, particularly tropical forests, reduction in forest cover has continued (FAO, 2005). Much of the systematic degradation of ecosystems, including forests, has been driven by the expansion of agriculture, and to a lesser extent by human settlement, mining, oil and gas and infrastructure (Millennium Ecosystem Assessment, 2005). Ultimately the process of ecosystem degradation is driven by the size and expansion of the global economy, which is driven by human population and per capita economic growth.

We now have a population of 6.7 billion, likely to rise to 10.5 billion before peaking (UN DESA, 2009). The global economy is approximately \$62.2 trillion (CIA, 2009), and growing on average between 2% and 3% per annum. This means that the global economy is likely to double every 24 to 36 years. Many forms of consumption have outstripped economic growth. For example meat production, energy consumption, and paper usage have all grown at or faster than economic growth (FAOSTAT, 2009). Growing consumption impacts ecosystems both directly and indirectly. Conversion of Brazilian rainforest to cattle grazing, or of Indonesian rainforest to palm oil, has direct and long-lasting consequences. Excessive pollution and climate change have more chronic impacts on ecosystems via potential changes to disturbance factors like wildfire and insect epidemic, and shifts in species distributions.

In fact since the Earth Summit in 1992 we have been able to foresee that the global system would be systematically changed by consumption and that the three great challenges would be related to soil conservation and access to freshwater, biodiversity conservation and global climate change. Forest conservation fundamentally intersects these three challenges—forests are one of the key elements of the global carbon cycle (Malhi, Y et al, 2002), regulate soil conservation and water quality, and provide the basis for something like 50% of the diversity of life on earth (Millennium Ecosystem Assessment, 2005). As our population grows and the economy becomes larger, there is a conundrum. On the one hand we know that these ecosystems provide services such as water purification, carbon storage and soil conservation, but on the other we continue to convert these ecosystems to production systems to support ever-increasing demand for food, fiber, human settlement and infrastructure.

No one would realistically expect that we might end up with a planet that has no natural ecosystems left. But how do we diverge from the pattern of economic growth linked to conversion of ecosystems from conservation functions to production functions? The problem is that production systems generate profit and attract capital for development, while conservation functions do not. Effectively, nature is unpriced, and therefore is used wastefully as a low cost input to production. In our present economic system it is more cost effective to convert more land to production than it is to intensify production on the existing landbase. It is easy to argue that this represents a market failure.

There have been many attempts to use planning, policies, aid programs and philanthropy to halt the degradation and loss of forests (e.g. the Forest Principles developed at the 1992 Earth Summit and the FAO Tropical Forest

Action Plan which was developed in 1985). They have largely failed, because they don't change the underlying price signals and economic drivers. As a result there is now a rapidly escalating effort to create price signals for ecosystems and for ecosystem services as a way of actually making conservation functions valuable (Ecosystem Marketplace, 2009). Once something becomes valuable, it can attract capital and will become more costly to use as an input to production. This paper aims to discuss how these markets for ecosystem services are emerging, and how they might contribute to a kind of global end-game where production and conservation functions are stabilized, and human society effectively makes an accommodation with nature.

The Concept of Markets for Ecosystem Services

The question is how to introduce these price signals into an economic system that has benefited from nature being unpriced. In some ways it is not as difficult as it may seem. Markets have long understood the concept of auctioning fishing quotas, timber rights, grazing rights and irrigation water. It is only a step more to commodify carbon storage, watershed or catchment management and species conservation. The challenge in any emerging market, however, is to create both supply and demand. The demand side of ecosystem services has been lacking.

There are a growing range of examples of markets for ecosystem services, and while these remain small they are expanding rapidly. In these markets demand is generally created by either voluntary action or by government regulation. Voluntary action examples might include the sale of carbon credits from Australian re-vegetation projects to automobile owners by Greenfleet (Greenfleet, 2009), payment to landowners by Coca-Cola for clean water (Clinton Global Initiative, 2008), and sponsorship of duck habitat conservation by duck hunters (Ducks Unlimited, 2009).

Yet voluntary funding is invariably a marginal act, and does not transform price signals. That only occurs through regulation. During the 1970's the US Government passed the Clean Water Act (US Environmental Protection Agency, 2008) and the Endangered Species Act (United States Fish and Wildlife Service, 2009). These two acts provide an interesting case study of the establishment of price signals for ecosystems. In each case the Act created a no net loss philosophy for wetlands and endangered species respectively. Over time regulatory instruments emerged to allow for wetlands mitigation banking and endangered species banking. These were market-based instruments. For example if I am a property developer wanting to convert habitat for an endangered species, I will need to pay someone else to enhance the conservation or expand the habitat for the same species elsewhere. These markets often worked by creating large areas of functional habitat, or by rehabilitating degraded areas into productive wetlands. In many cases the 'banks' created to sell wetland or endangered species conservation became highly valuable. Many developers found that their properties were more valuable if managed for conservation rather than property development.

The mitigation banking industry in the US is now a well-regulated sector with hundreds of millions of dollars in sales annually (speciesbanking.com, 2008). The sector has small and medium sized businesses, increasingly attracts private equity funding, and there is a growing sophistication in the industry. In fact it could be seen as a model for how an ecosystem market can unfold.

The other evolving market that came from the US was the Clean Air Act (US Environmental Protection Agency, 2009) and its creation of a market for reductions in sulfur dioxide emissions causing acid rain. The regulations set a cap on emissions and allowed polluters to trade the allowances necessary to comply with the cap. This meant that a company who could reduce their emissions more inexpensively would reduce more than required and sell the excess reductions to companies with a higher cost of compliance. This market based approach proved highly successful and the cost of meeting the targeted reductions was far lower than had been predicted by economic models (Gutt, E. et.al, 2000).

The US government also promoted the use of markets to address greenhouse gas reductions in the 1990's. While the US ultimately pulled out of the Kyoto Protocol, the use of flexibility mechanisms like carbon trading was a

legacy of US negotiating strategies. The US and other countries also promoted the incorporation of forest conservation and reforestation into the global carbon market as an offset (or carbon credit against emissions). While this ultimately was curtailed in the Kyoto Protocol and rejected for incorporation to the European Union Emissions Trading Scheme (European Union Emissions Trading Scheme, 2009) forestry has now begun to see a resurgence of interest in non-European carbon markets such as the Australian Carbon Pollution Reduction Scheme (Department of Climate Change, 2009) , the NZ Emissions Trading Scheme (Ministry for the Environment, 2009), the California Forestry Protocols (Climate Action Reserve, 2009) and most recently and significant the US Federal Waxman- Markey Bill (Committee on Energy and Commerce, 2009). Significant innovation is occurring related to new concepts like Reductions in Emissions from Deforestation and Forest Degradation (“REDD”) (VCS Association, 2008 and Avoided Deforestation Partners, 2008) that could create whole new markets for forest conservation.

So there are functional examples of regulatory systems across carbon, water and biodiversity attributes. The challenge is to make these instruments ubiquitous in the global economy, and subject to a comprehensive no net loss policy at national and international levels. This will not be easy, but the ultimate solution may well be found in the problem itself—effectively embedding ecosystem services into the supply chains to consumers.

Conservation and Production – Landscapes and Human Society

Several recent studies confirm the degree to which human society and its demand for goods and services now dominates nature (see for example the Millennium Ecosystem Assessment or the WWF Living Planet Report). Economic growth is inexorable, but ecosystems are finite. Therefore as the economy grows we have seen a steady erosion of natural systems resulting in a series of negative consequences. Loss of ecosystem function is linked with soil erosion, loss of productivity, the spread of weeds, feral animals and disease, increased flooding, nutrient leaching, hypoxic zones, and a host of other outcomes. It is as if the demand for goods is now seriously impeding the capacity to maintain ecosystem services, and some form of balance must be sought. The lack of pricing for ecosystem services means that there is no optimal outcome where the marginal benefit of increased production is balanced against the marginal cost of lost ecosystem services. The market based pricing of goods will dominate the unpriced public services of ecosystems even if there is a huge negative net cost or ‘externality’ to society. So the answer has to be to price ecosystems and their services.

The approach that has the most merit is to regulate those industries that either impact or benefit from water quality or biodiversity, or which have greenhouse gas emissions, such that they have to avoid, reduce and ultimately mitigate their environmental impacts. In parallel we need to commoditize the ecosystem services so that they can be conserved and enhanced by private capital flows the same way that oil palm or beef is produced. The production functions then will need to acquire ecosystem services credits in order to continue to operate or expand operations. This embeds the conservation functions in the production functions and consumption ultimately must pay for the costs of maintaining ecosystem services. As the global economy grows and demand rises, ecosystems should become steadily more valuable. This will lead to greater emphasis on resource use efficiency, production efficiency, recycling, etc. Effectively there should be some kind of economic balance where the cost of further impacts to ecosystems becomes too expensive to contemplate.

The supply side instruments are starting to become clear. The first is the emerging forest carbon market. While the Kyoto protocol has provided limited innovation around forest carbon products, there has been substantial new thinking coming from the United States and the voluntary carbon market (see AD Partners website cited above).

Standards for creating carbon conservation value related to reforestation, improved forest management and forest conservation are all emerging into a workable framework. The US Waxman Markey bill was a key step forward and comprehensively integrated both domestic and international forest carbon management into a legislative framework. The work undertaken by US legislators is likely to support a strong US position on the incorporation of forest carbon instruments into the negotiations at COP15 on a successor international agreement to the Kyoto Protocol in 2013.

The second key instrument is a biodiversity product. Unlike carbon, biodiversity is not easily measurable or commodifiable. Biodiversity is also a surrogate itself for a suite of ecosystem services related to purification of water, pollination, disease control, and general maintenance of productivity and natural function. It is hard to comprehend a completely homogenized world with complex natural systems largely gone, and human managed exotic production systems completely dominant. It is probably hard to think through what such a world might look like, but there are certainly regions of the earth already well down the path of complete homogenization.

The mitigation banking industry in the US is probably the most likely model for a global biodiversity conservation product. The approach is based on institutionalizing a philosophy of no net loss and then, based on assessments, allowing development activities to mitigate their impact by buying 'credits' from mitigation bankers. The ultimate expression of this approach could be large scale protected areas funded by mitigation banking fees. New Forests has recently established the Malua Biobank (MWHCB Inc, 2009) in Sabah, Malaysia, that is trying to experiment with exporting the mitigation banking approach to conserving tropical rainforests with a globally significant suite of plant and animal species. In this case serialized Biodiversity Conservation Certificates are created and listed on the TZ1 exchange (TZ1 Market, 2009). Each certificate represents the rehabilitation and conservation management of 100 square metres of dipterocarp forest. Oil palm plantations can buy these certificates and attach them to their exports of crude palm oil. In fact the product works very well with the palm oil supply chain. Each hectare of palm oil plantation produces about 100 tonnes of crude palm oil during its 25 year life. If a biodiversity certificate is attached to each tonne produced, the hectare of palm oil plantation effectively sponsors the rehabilitation and conservation management of one hectare of the biobank. This makes the palm oil producer the sponsor of biodiversity conservation rather than the cause of its depletion.

The third key instrument is a water quality related product. The impacts of production activities on water quality include soil erosion and resultant turbidity, increases in dissolved nutrients, particularly nitrates and phosphates, and runoff of pesticides. These impacts affect water quality directly for downstream human use, but also affect aquatic systems health via impacts on benthic fauna, fish, bio-accumulation of pesticides, algal blooms, hypoxia, and coral bleaching. There are also specific regional impacts on water quality from temperature changes, salinisation, acid sulphate soils and shifts in pH.

Like the biodiversity related instruments, water quality problems are often localized and need to be regulated at the level of catchments or watersheds. In the US, again, there have been a number of experiments and pilot programs related to water quality trading (Environmental Trading Network, 2009). In general the nutrient trading regimes have been designed so that point source polluters like sewage treatment plants could buy offsets after achieving a certain level of in-house pollution control. This reflects the reality that the last 2 or 3 percent reductions may have extremely high costs, and paying farmers to fence riparian zones, or use precision fertilization practices may deliver additional reductions in nutrient loss at a far lower cost.

A major water quality initiative is currently being undertaken in the Australian state of Queensland, where catchments draining into the Great Barrier Reef have been put under a stringent continuous improvement and monitoring system. All land management practices have been benchmarked for their water quality impacts, and payment schemes have been instituted to support landowners in making a transition to lower impact land management practices. The catchments have been modeled and the level of nutrients and other pollutants can be forecast under different levels of program take-up. The specific goal of the Australian Government is to reduce nutrient loads by 50% in the Great Barrier Reef Lagoon. The Government is paying approximately \$AU200 million over four years to landowners under the Reef Rescue Program (Caring for our Country, 2009). The question is what will happen as Government funding comes to an end. The Government funding was a by-product of selling the national telephone company. Further initiatives would need to come from tax revenues, which is unlikely given the current budget deficit.

New Forests has put forward a concept for a water quality bank for the Great Barrier Reef Catchments that will perpetuate the price signals for sustainable land management via a Nutrient Bank. The concept is based on setting a baseline of current loads of nutrients, sediment and chemicals and creating a kind of water pollution unit. Monthly water quality monitoring at key points can be used to build an annual water quality rating. If the water quality rating is below the baseline, then there are credits created. These credits would be listed and saleable. The revenue gained from selling these credits would be used for three purposes—to pay landowners an upfront price for improved land management, to generate a return to private investors in the bank and to pay dividends to landowners who maintain their properties under higher levels of land management practice. Downstream beneficiaries of the improved water quality like tourism operators could be buyers or the credits could be embedded in the agricultural commodities, principally sugar. The government could also be a buyer, at least initially to act on behalf of the general public good.

What is the End-Game?

There have been continuing attempts to set targets and policy mechanisms for conservation of ecosystems. The global goal of 10% protected areas in each bioregion is a major example, supported by the United Nations Convention on Biological Diversity, the IUCN and others. Conservation International has embraced the concept of protecting key 'hotspots' which are areas of unique endemism and biodiversity. The concept of protected areas works reasonably well in developed countries with substantial resources, but even there the protected areas tend to be over-represented in non-productive ecosystems (alpine, mountainous terrain, arctic regions, deserts, etc.) and under-represented in productive systems used for agriculture, grazing and human settlement.

Given that most productive areas are under private ownership or management, it proves expensive and controversial for governments to use tax-payers dollars to acquire these areas for rehabilitation or conservation. Some NGO's have sought to augment formally protected areas in Government ownership with informal conservation areas often established by the purchase of conservation easements or development rights from property owners. These philanthropic conservation funds have made substantial contribution to protected areas networks, but the general view is that they are not capable of out-competing private investment in development activities. A recent study by the Union of Concerned Scientists and the UK government suggested that funding of \$US20 to \$US33 billion per annum would be needed to reduce deforestation by 50% over the next ten to twenty years. That is 250% to 400% of the current combined funding of the World Bank, Overseas Development Assistance and Philanthropy. If we wish to completely stop all further rainforest conversion we would potentially be looking at funding of \$50 billion per annum or more.

Another way to look at the problem of forest conservation finance is to explore the goals for emissions reduction in 2030 and work backwards. It has been suggested that global agreements should aim for 80% reductions in greenhouse gas emissions by 2050 and that this will require approximately 30 billion tonnes per annum of greenhouse gas reductions relative to business as usual by 2030. Analysis of that target suggests that at least 20% of the net emission reduction will need to come from rainforest conservation by 2030. That is 5 billion tonnes of carbon dioxide equivalent reductions per annum. At a global carbon price of \$US20 that represents a revenue stream of \$US100 billion per annum. If we securitized such a cash flow at a 10% real cash yield, it would represent an asset value of the world's rainforests of \$US1 trillion. That is approximately equal to 5% of the institutional financial assets in the United States, or approximately equal to the entire assets of the Australian Superannuation industry.

On the other hand if we compare this with the value of agricultural commodities it is less daunting. For example, Malaysia exports around 15 million tonnes of crude palm oil for \$US8 billion per annum. Globally oil from oil seeds is approximately a \$US50 billion per annum industry (FAO). Meat, sugar, timber, and other commodities are even greater in value. The Union of Concerned Scientists recently suggested that global timber imports are \$US160

billion per annum – a 5% tax would generate \$US8 billion per annum for REDD or other forest conservation initiatives (Union of Concerned Scientists USA, 2009).

A tax is generally a blunt instrument as it affects both sustainable and unsustainable producers equally. A more effective approach would be to create certification or accreditation processes that allow sustainably produced goods to either trade at a premium, or to have lower costs associated with their lower environmental impacts. There are a number of these certification processes now in operations. The first and longest running is the Forest Stewardship Council (Forest Stewardship Council, 2009) which certifies the sustainable management of forests and provides for chain of custody certification so that end users can differentiate between wood products coming from Forest Stewardship Council Certified forests and those that are not. There are now a series of commodity Round-Tables (eg Soy, Palm Oil, Sugar) that are proposing certification standards and mechanisms to differentiate sustainable production from unsustainable production (RSPO, 2009).

This is a critical first step, but not quite enough to achieve a no net loss end-game. The sustainable production systems are accredited to best practice in terms of not clearing high conservation value forests, minimizing pesticide use, implementing fair employment practices, etc. They do not however require zero environmental impact. This means that as the global economy doubles and redoubles in size, the consumption continuously chips away at natural systems, albeit less rapidly than under unsustainable production systems. That is why the idea of actually embedding the ecosystem services products described above can more realistically move us towards an ultimate solution.

The way this might work is that each bio-region would have an inventory of its ecosystems and state of the ecosystem services. In some cases the goal might be to stabilize the system, in other cases it could be to

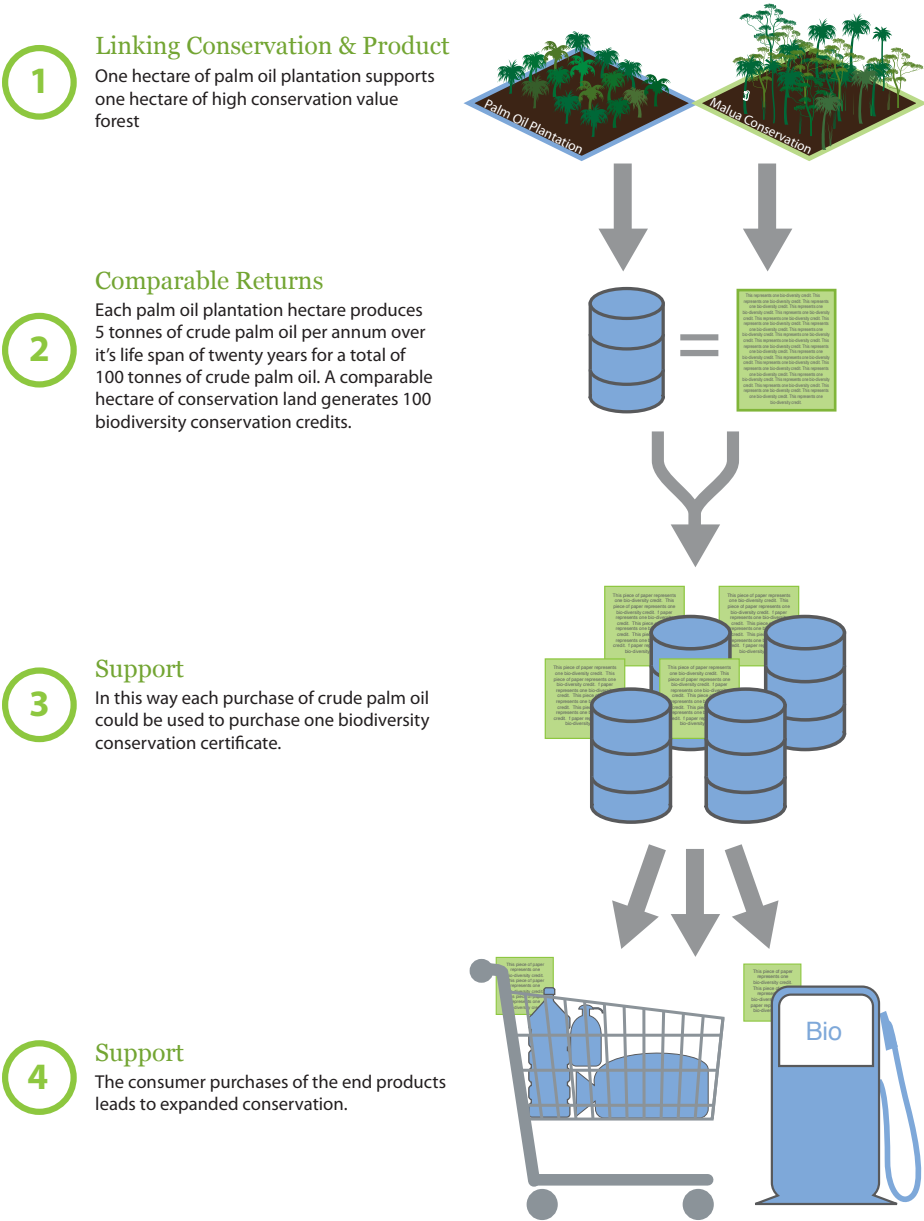


Figure 1. An example of how biodiversity conservation credits can be integrated into the crude palm oil supply chain.

rehabilitate and recover some ecosystem services to a higher level (eg in our Great Barrier Reef example). In some rare cases it may even be acceptable to draw down further on the ecosystems before determining a stabilization point. Whatever that point is, then the ecosystems providing those services would be commodified into REDD projects, bio-banks and water quality banks. The credits could then be attached to the commodities produced in those bio- regions to create a systematic sponsorship of the conservation functions by the production functions. As an example of this, the Malua bio-bank can generate a commercially acceptable return from selling its Biodiversity Conservation Certificates (BCC) at \$US10 per 100 square metres of forest rehabilitation and conservation management. Therefore, attaching one BCC to one tonne of crude palm oil only adds 1.5% to the current price (Figure 1).

The bio-regions may be supporting not only local commodity agribusiness, and point source industries like mining, oil and gas, but could be servicing global industries like electricity generation via REDD markets. In this case the bio-banks could be established to sell multiple ecosystem commodities including biodiversity certificates to palm

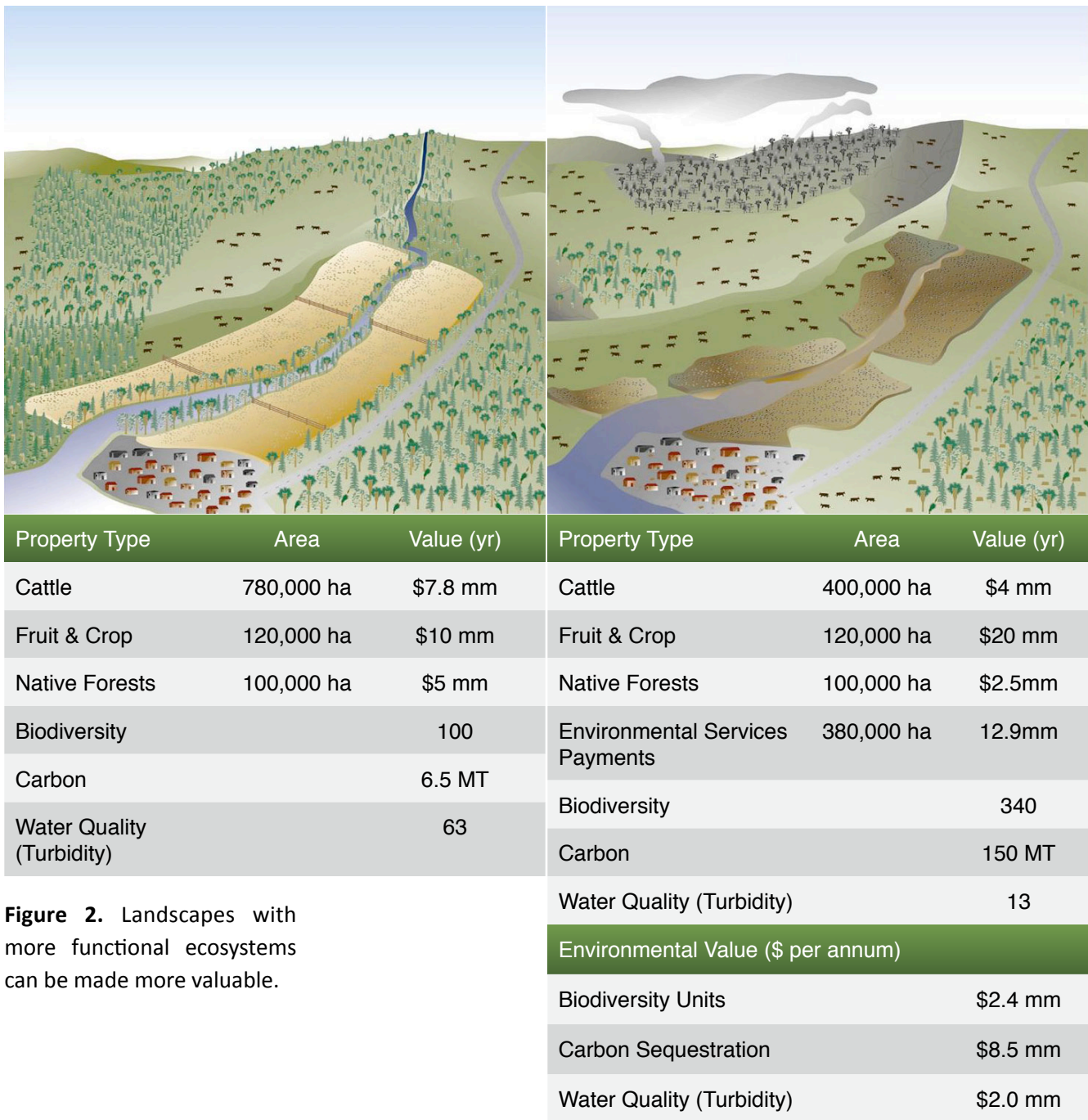


Figure 2. Landscapes with more functional ecosystems can be made more valuable.

oil companies, REDD credits to overseas energy sector firms, and water quality credits to downstream water users. Over time as the global economy grows the eco-commodities could become hugely valuable in line with their growing importance in supporting an ever larger global economy. The result would be landscapes that integrate production and conservation functions on a commercial basis (Figure 2).

Conclusion

We appear to be on the verge of some breakthrough ideas that could shift the balance in the economics of deforestation and forest degradation. Not only is there a renewed emphasis on incorporating forests into the global carbon market, but the global agri- business industry is under pressure to introduce third party certification of the sustainability of production systems. These trends need to be linked with mechanisms to standardize the ecosystem services products like REDD, bio-banks and water quality or watershed conservation banks. We can already see the potential instruments emerging in voluntary markets and in some national level regulatory experience. The challenge now is to move ahead with implementation fast enough that the tide can be turned before there is little left to save.

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About New Forests

New Forests (see www.newforests.com.au) is an investment management and advisory services firm specialising in forestry and land-based environmental markets, such as timber, carbon, biodiversity and water. The company's investment philosophy seeks to deliver traditional timber returns as well as returns from eco products, such as certified timber, renewable energy, carbon credits, biodiversity benefits and water-quality improvements. The company is headquartered in Sydney, Australia, with offices in Washington, D.C., San Francisco and Kota Kinabalu, Malaysia. New Forests holds an Australian Financial Services License.

New Forests manages over \$250 million in sustainable forestry and eco product (carbon, biodiversity, and water) assets in the United States, Australia, New Zealand, Southeast Asia and the Pacific Islands. This includes the full value chain of services, from the development of investment theses and portfolio management to operational execution and asset management. New Forests Advisory Services business provides policy and market analysis, regulatory advice, technical modeling capabilities and investment strategy to external clients and internal investment management teams. The business line is focused on developing commercial solutions at the intersection of land-based investment, conservation and climate change mitigation by identifying and quantifying environmental asset opportunities.

New Forests' staff includes experienced professionals across timberland investment, operational forestry, environmental management and finance, and the company provides its clients with a unique combination of forestry, carbon and financial management skills. Staff members have been involved in forest carbon transactions since the 1990s and have contributed to the development of forestry offset rules in Australia, New Zealand, California, the United States, Canada and through the UNFCCC, as well as the drafting of the Agriculture, Forestry and Other Land Use guidelines for the Voluntary Carbon Standard.

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