Market Based Ecosystem Services

A proposed *National Stewardship Initiative*

A report for

by Sam Archer

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Foreword

Given the extreme climatic events experienced this decade only the most ardent sceptics continue to deny that we have entered a period of pronounced climate variability, quite probably lasting climate change. Australian agriculture is particularly vulnerable to this variability and limited in its capacity to proactively respond. Farmers are faced with competing demands as they attempt to balance their productivity and profitability with the natural resources and ecosystems on which they rely for their livelihood.

Since the 1980's public debate has increasingly focussed on issues surrounding sustainable resource management including water, salinity, biodiversity, land degradation and more recently carbon emissions. This heightened awareness has been driven by the impacts of climate change, food and water security, fossil fuel dependence, development pressures, an urban/rural disconnect, a globalised economy and ecosystem decline.

Competing demands for agricultural land have also been accompanied by an increased expectation that Australian farmers have a responsibility, as stewards, to manage their land for the benefit of the wider community. The Wentworth Group[1] advocates paying farmers for these environmental goods and services provided they benefit the rest of the community and are above the farmer's environmental duty of care[2].

The Australian Government does not have the resources to fully fund a national stewardship scheme. Market Based Instruments (MBI's), however, are a potential economic solution to deliver many of these environmental initiatives. MBI's are financial mechanisms, which are used to positively influence change, in this instance environmental management, by allowing market forces to allocate scarce resources to appropriate stakeholders.

To date there has been little representation from the farm sector in the development or delivery of MBI's. It has largely been Government driven with input from both State and Federal agricultural and environmental agencies together with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and various university research schools. Despite this lack of engagement at an industry level, there is growing interest in the concept at

[1] The Wentworth Group of Concerned Scientists.
[2] The Wentworth Group (2002:4), *Blueprint for a Living Continent*.

the individual farm level with geographically widespread participation in two National MBI Pilot schemes run throughout Australia[3].

The intent of this report is to promote a model for a sustainable, commercially viable, pragmatic and publicly acceptable national stewardship initiative. It seeks to constructively participate in the environmental debate and engage all stakeholders toward achieving sustainable and resilient outcomes, by improving the understanding of private sector/consumer funded stewardship initiatives broadly based around carbon, water and biodiversity.

The report examines MBI's and stewardship programmes employed throughout the Americas, Great Britain, Europe and India. It concludes that there is significant scope for Australia to strengthen its nascent stewardship programmes by adopting a range of initiatives, which will enable it to move toward a genuinely sustainable, more comprehensively funded, cost effective, systems based approach to ecosystem preservation and management.

[3] Australian Government (2004), *Managing our natural resources: can markets help?*

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Abbreviations

BMP: Best Management Practice

CAP: Common Agricultural Policy

CCX: Chicago Climate Exchange

CMA: Catchment Management Authority

DEFRA: Department for Environment, Food and Rural Affairs

DU: Ducks Unlimited

EPBC: Environment Protection and Biodiversity Conservation Act

ESS: Environmental Stewardship Scheme

ETS: Emissions Trading Scheme

FAO: Food and Agriculture Organisation

GHG: Greenhouse Gases

MA: Millennium Ecosystem Assessment

MBI: Market Based Instrument

MDB: Murray Darling Basin

M&E: Monitoring and Evaluation

MIS: Managed Investment Scheme

MW: Megawatt

NFF: National Farmers' Federation

NRM: Natural Resource Management

R&D: Research and Development

SFO: State Farm Organisation

TU: Trout Unlimited

USDA: United States Department of Agriculture

WTO: World Trade Organisation

Contents

Executive Summary

1. The world's ecosystems face competing demands from agriculture, mining, forestry and urban development. Forecasts indicate the world's population will increase 50% by 2050 and food demand will double in the next 50 years, placing increased pressure on governments to provide cost-effective solutions.

2. These influences will place increasing pressure on the ability of ecosystems to provide vital environmental goods and services. The United Nations *Millennium Ecosystem Assessment* identified four primary services provided by the world's ecosystems: provisioning, regulating, supporting and cultural.

3. The world's farmers have the greatest capacity to protect and enhance the world's ecosystems. They manage 60% of the world's productive landmass and 70% of its freshwater and have already developed numerous innovative ecosystem service schemes.

4. This paper proposes a National Australian Ecosystem Services Scheme (ESS) encompassing a private sector funded/consumer pays, whole-of-landscape approach as a cornerstone of a national climate change initiative. It would be voluntary, implemented on marginally productive land, and paid as a performance-based, annual cashflow stream.

5. Market prices often fail to fully incorporate environmental externalities and therefore underestimate the cost upon the environment. Paradigms are, however, changing. Consumers are paying for "green energy", organic food and Fairtrade products.

6. Australian Government policy is also changing and environmental stewardship is being encouraged. This is often on the same land where last century governments had mandated the clearing of native timber, provided financial incentives to capture and store water, and placed a bounty on native fauna.

7. An Australian ESS should deliver carbon, water, biodiversity, soil and salinity credits, together with renewable energy and biofuels. A balance, however, is required between food security, climate change initiatives and ecosystem preservation. Emissions trading policy, therefore, cannot be made in isolation and can only be part of a multi-faceted approach or portfolio of MBI's.

8. The Australian Government does not have the resources to fully fund a national stewardship scheme. It should provide enabling legislation, allow a lightly regulated non-government organisation to administer the scheme and the private sector/consumers to develop and foster the marketplace.

9. The scheme must be equitable, with consumers ultimately paying land managers, via a transfer pricing system, who deliver ecosystem benefits above their "environmental duty-of-care".

10. Confidence in the integrity of an ecosystem scheme will only eventuate if backed by proven scientific research and development (R&D). Agriculture's appetite to participate in an ongoing scheme will be influenced largely by their cost-benefit analysis and scheme flexibility.

11. Australia should seize the opportunity to lead the world in sustainable ecosystem preservation and management. Recognising that agriculture is vital to the nation's food security and sustainable ecosystem preservation, and that consumers therefore, need to pay the true price for ecosystem goods and services.

Objectives

The purpose of this study is to promote a model for a sustainable, commercially viable, pragmatic and publicly acceptable national stewardship initiative. It seeks to enable Natural Resource Management (NRM) stakeholders to develop a more comprehensive understanding of the role of MBI's in a whole-of-landscape approach to sustainable land management, recognising the integral role performed by resilient ecosystems.

It seeks to ensure that farmers are better informed when:

1. advocating a more equitable model for funding society's environmental expectations;
2. establishing multi-stakeholder partnerships, drawn from the sciences, environment, government, agriculture, civil society and indigenous organisations, to deliver environmental outcomes;
3. developing Environmental Management Systems for their properties;
4. implementing Best Management Practices in their businesses;
5. undertaking cost benefit comparisons for varying land types and enterprises;
6. negotiating NRM contracts; and,
7. reporting triple bottom-line results, that is, improvements in financial, social and environmental capital.

The study affirms the need for a National Ecosystem Services Scheme, highlighting a range of critical factors that will need to be addressed, if as a nation, we are to cost-effectively meet society's environmental needs and expectations.

Introduction

Competing demands exist for agricultural farmland including food production, mining, forestry, urban development and the delivery of environmental goods and services. Forecasts indicate that the world's population will increase fifty percent by 2050 from six to nine billion people, with food demand set to double in the next fifty years[4]. These escalating demands will place additional, and unsustainable, pressure on existing farmland and ecosystems.

National and international responses to these escalating needs vary greatly. Proposed solutions include; taking more land from the environment for agriculture, developing technological solutions to increase farm production including greater uptake of biotechnology, changing our dietary and consumption patterns, or more contentiously limiting population growth. All these options have the potential to polarise the public. They will, to varying degrees, prove politically unpalatable and have significant ecosystem impacts.

Ecosystem Services

Regardless of the policies adopted to address these demands, ecosystems and the services they provide are at considerable risk of being further diminished. The United Nations *Millennium Ecosystem Assessment* (MA) highlights that humanity and economies, "while buffered against environmental changes by culture and technology", are largely bounded by ecosystem limits and the services they provide[5].

The MA identified four primary ecosystem service categories. These are;

1) provisioning services, which include food, fibre, water, natural medicine and genetic resources;
2) regulating services, which include climate, water, erosion and pollination;
3) supporting services, which include soil formation, photosynthesis, water and nutrient cycling; and
4) cultural services, which include recreation, ecotourism, aesthetic and heritage values.

The MA also found that increasing demand for provisioning services is met at the expense of the other services[6]. This increased pressure, driven by population growth and changing

[4] Cnossen, (2008), *Asian demand - is it sustainable & what is the future?*
[5] United Nations (2005:vii), *Millennium Ecosystem Assessment: Ecosystems and Human Well-being: Current State and Trends*.
[6] United Nations (2005:4), *Millennium Ecosystem Assessment: Ecosystems and Human Well-being: Current State and Trend.*

consumption demands, is clearly not sustainable. Continued depletion of ecosystem resources will have significant consequences for human wellbeing, the environment, our inextricably linked economies and our capacity to effectively adapt to these changes.

Resilience is a key function underpinning adaptability within dynamic, healthy ecological systems. It describes an ecosystem's capacity to absorb shocks and maintain function. Low resilience leads to a low capacity to adapt and change. Environments that move from a diverse range of species to one with fewer species place greater pressure on the remaining ecological community to continue delivering the same ecosystem functions. This increased pressure creates vulnerability, leading to a greater propensity to suffer harm from external stresses and shocks, and an increased risk of more permanent ecological regime shifts[7].

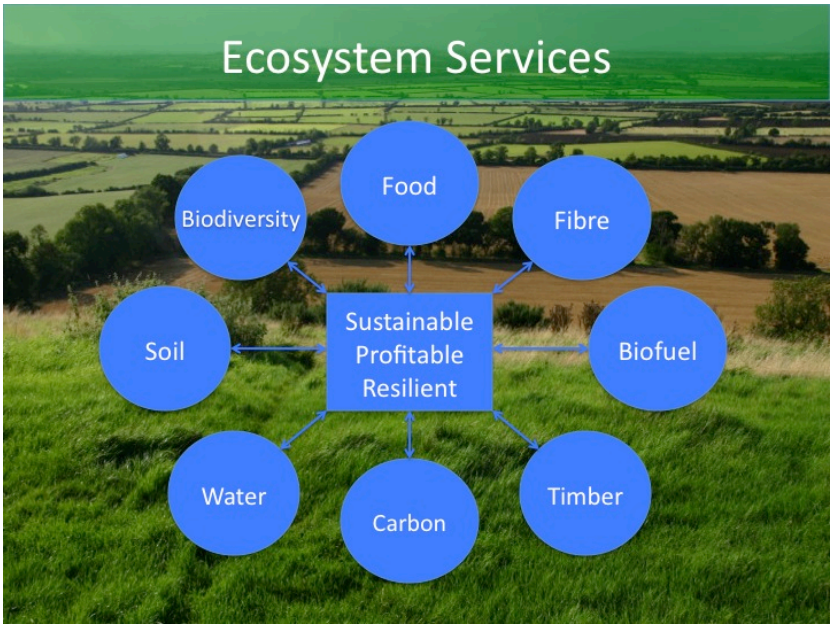
The MA established that many ecosystems have been significantly altered by human activity, predominantly in the last two centuries[8]. Within this context human induced ecological regime shifts to less productive and less desirable ecosystem states have resulted in formerly resilient ecosystems collapsing. At which point they are no longer capable of functioning as complex, interdependent environments delivering ecosystem services. Examples of these ecological shifts include the shrinking of the Aral Sea as major rivers were diverted for irrigation projects, the decline of the Florida Everglades as water was drained to enable agricultural and urban development, and the collapse of many of the world's fish stocks due to overfishing. Each of these changes has come at considerable cost in terms of human, economic and environmental capital, and highlights that investment in intact ecosystems will have a much higher cost benefit ratio than spending to retrospectively restore modified ecosystems[9].

Ecosystem transformation is often difficult to predict and more readily understood retrospectively. The environmental, social and economic impacts currently being experienced within Australia's drought affected Murray Darling Basin (MDB), may well be the precursor to changes that are more permanent and are already testing the system's resilience. Within the MDB the close interconnection between resilience, diversity and sustainability is clearly

[7] Walker et al (2006), *Resilience Thinking: Sustaining Ecosystems and People in a Changing World.*
[8] United Nations (2005:15), *Millennium Ecosystem Assessment: Ecosystems and Human Well-being: Current State and Trend.*
[9] The economic benefits of investing in intact ecosystems were found to provide a cost benefit ratio of 1:100 (Balmford et al, 2002:950-3).

manifested through growing concern around resource allocation, profitability, sustainability and community needs, including mental health.

Diagram 1: Agricultural Ecosystem Services.



Market Based Instruments

Historically Australia's NRM has been funded on a cost share basis between government and land managers and often applied in isolation of other NRM targets, resulting in a fragmented approach which does not recognise that ecosystems cross spatial boundaries. Grants[10] have traditionally been paid in total, upon completion of on-ground works and have not been performance based, that is, paid to farmers for tonnes of carbon sequestered, hectares of remnant vegetation protected, or megalitres of improved water quality achieved through nutrient load reduction. This "inputs" focussed policy position, coupled with agency funding programmes rarely lasting more than three years, has lead to a short-term "silo" focus on NRM outcomes. Furthermore, given the limited requirements and resources for monitoring and evaluation the cost-benefit of these public/private-funded programmes is difficult to assess, with many projects never reviewed.

MBI's could be used to effect "outputs" based NRM outcomes. These economic instruments provide a mechanism, which positively influences change by allowing market forces to

[10] The Australia and State Governments have spent approximately AU$4.2bn over the last ten years under the *Natural Heritage Trust* (NHT) AU$2.8bn and *National Action Plan for Salinity and Water Quality* (NAP) AU$1.4bn programmes (Australian National Audit Office: 2007-08). It has committed to spending a further AU$2.25bn over the next five years under the *Caring for our Country* programme http://www.nrm.gov.au/funding/future.html#funding. <accessed 15.10.09>

allocate scarce resources, such as land, labour, capital and water, to appropriate stakeholders based upon price and their respective risk to return profile. For example, retailers might preferentially purchase from farmers who demonstrated measurable environmental stewardship outcomes, paying as a priority those farmers who provided ecosystem services for the lowest cost with the highest benefit.

Environmental MBI's fall into three broad categories based on the different economic mechanisms they employ to influence change. These categories are;

1. Price-based mechanisms, which rely on price triggers to effect change. They include auctions, tenders, rebates and tax incentives. An example is the Federal Government's $42.5m pilot Environmental Stewardship Scheme aimed at protecting and enhancing Box Gum Grassy Woodlands in the slopes region of southern and central NSW. In this programme, tenders are assessed on their cost-benefit in delivering the targeted NRM outcomes.

2. Quantity-based mechanisms, which rely on mandating quantity targets. They include cap and trade schemes, and quotas. An example is the Australian Government's proposed Carbon Pollution Reduction Scheme where a cap will be placed on a national carbon emissions baseline and the market will trade carbon credits between those entities required to offset their emissions (buyers) and those entities capable of generating surplus credits (sellers). Non-compliance in meeting targets results in the application of financial penalties; or

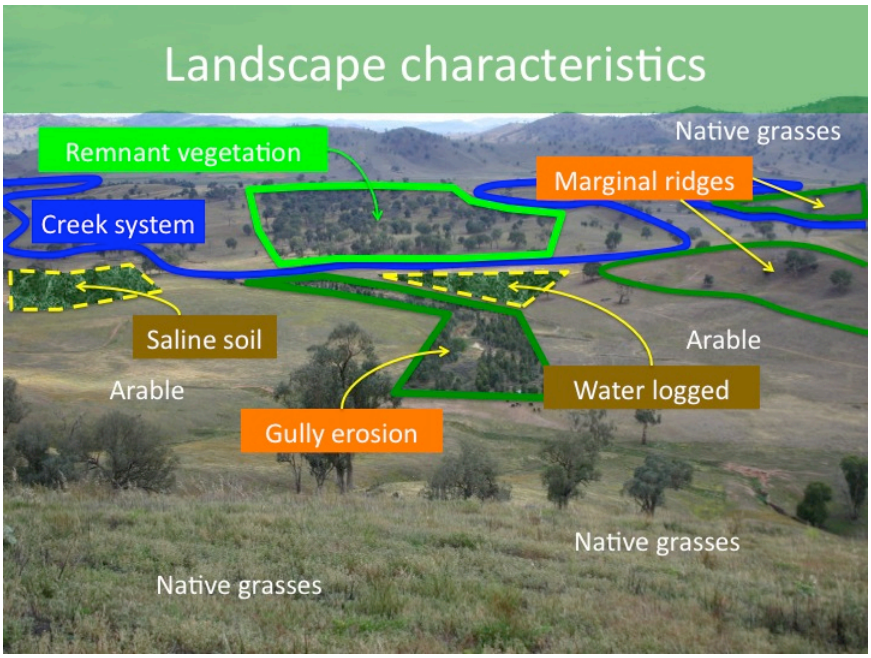
3. Market Friction, which relies on making private markets more efficient. An example is revolving funds, where farming properties with remnant vegetation of high conservation value are purchased by (say) a conservation trust and on-sold with a covenant attached to the property's title prescribing the management of the remnant vegetation.

Proposed National Ecosystem Services Scheme

This paper proposes a National Ecosystem Services Scheme (ESS) encompassing a private sector funded/consumer pays, whole-of-landscape approach. It would be voluntary, implemented on marginally productive land and paid as a performance-based, annual cashflow stream utilising a range of MBI's.

Farmers would be encouraged to identify their least productive land which might be a combination of, but not limited to; riparian zones, acidic or saline soils, remnant vegetation, water logged areas, wind swept ridge lines, highly eroded or degraded sites[11]. They would manage these marginal areas to deliver ecological goods and services, be they carbon, water, biodiversity[12] or soil related (see Diagram 2: *Landscape Features*).

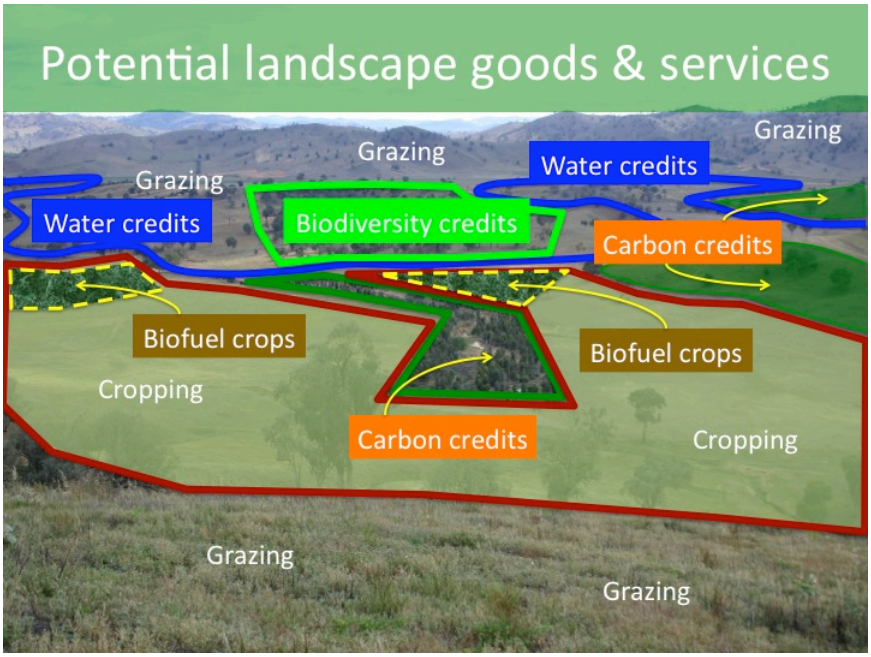
Diagram 2: *Landscape Features.*



These ecological goods and services would generate environmental "credits" that would entitle the farmer to an annual cashflow stream, with ongoing payment predicated on the continued delivery of environmental benefits to a standard of peer reviewed industry best management practice which were over and above the farmer's "environmental duty-of-care". In the proposed initiative, this is defined as "the maintenance of farmland in a condition that does not diminish its existing environmental attributes" (see Diagram 3: *Ecosystem Goods and Services in a Productive Farming Landscape*).

[11] Often the least productive land has been modified the least, resulting in it retaining greater ecological diversity.
[12] Biodiversity includes both native flora and fauna.

Diagram 3: ***Ecosystem Goods and Services in a Productive Farming Landscape.***



Background

Nations throughout the world are faced with many similar and interrelated issues; the impacts of climate change, food and water security, fossil fuel dependence, development pressures, an urban/rural disconnect, a globalised economy and ecosystem decline. Responses to these issues vary greatly, due in large part to each nation's political, economic, historic and cultural legacies.

Despite these varied responses, enduring ecosystem preservation can most effectively be achieved by engaging those land managers who have the greatest capacity to effect land use change. These are the world's farmers. They manage 60% of the world's productive landmass and 70% of its freshwater[13]. Similarly, Australia's farmers manage 61% of Australia's landmass, representing 470 million hectares (4.7 million km^2), and are licensed by Government regulators to use 65% of its freshwater[14], in those years of average rainfall.

Table 1: *Australian Land Use*[15].

Land Use	Area (sq. km)	%
Grazing	4,424,070	57.54%
Dryland agriculture	237,096	3.08%
Irrigated agriculture	30,535	0.40%
Minimal use	1,169,748	15.21%
Other protected areas including Indigenous uses	985,749	12.82%
Nature conservation	529,380	6.89%
Forestry	149,943	1.95%
Water	134,869	1.75%
Built environment	23,473	0.31%
No data	2,274	0.03%
Mining	1,366	0.02%
Total	**7,688,503**	**100.00%**

Most farmers are very mindful of the balance between their financial and environmental resources and are intuitively good stewards of the land. Of Australia's 150,000 farm businesses, 94% have voluntarily undertaken some form of NRM activity to; increase productivity (89%), increase sustainability (88%), protect the environment (75%), increase land values (72%) and improve risk management (64%)[16]. Of those farms, 52% have protected native vegetation, 45% have protected wetlands and 49% have protected river and

[13] Food and Agricultural Organisation (2006), *ResourcesSTAT*. http://faostat.fao.org/site/291/default.aspx. <accessed 29.07.09>

[14] National Water Commission, *Australian Water Resources 2005* http://www.water.gov.au/WaterUse/WaterUsedByTheEconomy/index.aspx?Menu=Level1_4_2 <accessed 15.10.09>

[15] Bureau of Rural Science, *Land use in Australia (based on 2001/02 Land Use of Australia, Version 3)*. adl.brs.gov.au/mapserv/landuse/pdf.../Web_LandUseataGlance.pdf. <accessed 15.10.09>

[16] Australian Bureau of Statistics (2008:13), *Natural Resource Management on Australian Farms 2006-07*.

creek banks[17]. This has been balanced with producing sufficient food to feed over 60 million people each day[18]. It is not uncommon, however, for some sections of the urban-centric media to conveniently portray farmers as environmental vandals. This is despite the fact that many of the environmental problems currently faced in Australia are the direct result of Government policy of the day;

> *'In the past governments have inadvertently contributed to many of the adverse environmental impacts associated with agriculture. Government sponsored and encouraged much of the irrigation and land clearing for agricultural development, directly or indirectly – albeit with the best intentions. In some cases, the environmental consequences were not known. In others, evidence of the possible consequences was ignored or discounted'*[19]

Stewardship Payments

Given that there are numerous competing demands for agricultural land, a stewardship scheme must be profitable at scale to achieve effective, voluntary land use change. Until stewardship payments cover the risk-adjusted, time value, capital cost of the preservation works and ongoing opportunity cost for lost annual profit, or can be shown to make a demonstrable contribution to farm sustainability, participation will be largely limited to those farmers with strong ideological underpinnings who have the discretionary capital to participate in NRM initiatives. This will undoubtedly preclude the participation of many farmers irrespective of whether they are in developed, emerging or third world economies.

Within Australia, the Wentworth Group advocates five key changes to environmental management to ensure a sustainable future for Australia. Paying farmers for environmental services is one of these changes, provided that the services delivered benefit the rest of the community and are above the farmer's duty of care for their land[20]. This eminent and influential group have led Australia's NRM debate throughout much of this decade and governments of all persuasions look to them for advice to resolve the environmental issues faced by the nation. They propose that "we need to change how we farm – reversing the onus of responsibility and creating opportunity – by improving economic signals and support"[21], and that "degradation of natural systems occurs because our economy makes it cheaper to degrade Australia than look after it"[22].

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[17] Australian Bureau of Statistics (2009:14), *Land Management and Farming in Australia 2007-08*.
[18] CSIRO (2009), *World Food Day – CSIRO rising to the challenges*. http://www.csiro.au/news/World-Food-Day-09.html <accessed 05.11.09>
[19] Industry Commission (1988), *The Role of Economic Instruments in Managing the Environment*, as cited in Collins and Whitten (2007:17).
[20] Wentworth Group (2002:4), *Blueprint for a Living Continent*.
[21] Wentworth Group (2002:13), *Blueprint for a Living Continent*.
[22] Possingham et al., (2002:15), *Sustaining our Natural Systems and Biodiversity: an independent report to the Prime Minister's Science, Engineering and Innovation Council*.

Few, if any, governments have the resources to fully fund a national stewardship scheme. Consumers and the corporate sector can, however, potentially provide a much larger financial base with which to fund environmental initiatives. As consumer awareness grows they are increasingly prepared to pay a premium for environmentally and ethically produced goods, for example; "green" energy, organic food, ecotourism and Fairtrade[23] products. All of which are increasing in demand and more readily available than previous decades.

However, within the environmental services market the corporate sector and the farmer, as buyer and seller respectively, are unlikely to participate in these initiatives unless there is a clear cost benefit: a benefit that is underpinned by good science, good economics and good policy.

Measuring and valuing the environmental benefits that MBI's seek to provide remains a major hurdle to significant market uptake of stewardship schemes. Investors, in any market, seek confidence that the goods or services in which they are investing can be measured, are marketable and liquid, and therefore can be valued. This enables the investor to determine if the investment is generating an appropriate risk-adjusted return. Where certainty or liquidity is lacking, markets will price the product at a discount, as occurs with carbon credits traded on the Chicago Climate Exchange's (CCX) [24] voluntary carbon market when compared with the European Union's regulated emissions trading scheme. During the last five years Carbon Financial Instruments (CFI's), with a December 2009 settlement, have traded on the CCX in a price range of US$0.10 to US$7.40 compared with the European Climate Exchange (ECX) with a price range of €8.20 to €30.53[25].

Agriculture's Participation

Although the potential implications for agriculture are significant, the industry has not largely engaged in the stewardship debate. An exception is The National Farmers' Federation (NFF) who, in their 2007 pre-budget submission, called for the development of an Environmental Stewardship Programme to fund private landholders to deliver environmental outcomes. They stated "that an effective stewardship programme is fundamental to changing the current

[23] In 2008 consumers spent an estimated €2.9 billion on Fairtrade products globally, representing a 22% increase in worldwide sales. http://www.fairtrade.org.uk/press_office/press_releases_and_statements/jun_2009/ <accessed 28.06.09>

[24] Chicago Climate Exchange: http://www.chicagoclimatex.com/ <accessed 28.06.09>

[25] Prices and Volume: ECX EUA Futures Contract (21 April 2005 - 05 November 2009): http://www.ecx.eu/EUA-Futures. Historical downloads: CCX Market Data http://www.chicagoclimatex.com/market/data/summary.jsf <accessed 06.11.09>.

regulation based NRM approach to a market-driven approach based on incentives"[26] and encouraged the Australian Government to develop a scheme in consultation with farming, environmental and community groups.

The Australian Government, together with the NFF and other key stakeholders, has since developed a pilot stewardship scheme targeting one ecological community, Box Gum Grassy Woodlands, in the slopes region of southern and central New South Wales. The NFF in its 2009 Federal Budget Submission has subsequently called for an expansion of the Environmental Stewardship programme to include all ecological communities and species protected under the Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act)[27]. At a state level a number of stewardship schemes have recently been developed by regional NRM agencies[28], mostly seeking to deliver biodiversity outcomes.

Most Australian agricultural organisations however have been slow to articulate a comprehensive NRM strategy. Although all Peak Commodity Groups and State Farm Organisations (SFO's) acknowledge that NRM and sustainability are crucial to the future of the industry, few of them have developed detailed NRM policies, which are in the public domain, with a stated position on MBI's. This has to change. It is clearly in the industry's interests to promote sustainable, commercially viable, pragmatic and publicly acceptable NRM initiatives. By taking a proactive stance in the environmental debate and engaging all stakeholders, agriculture will have a greater opportunity to achieve realistic sustainable and resilient outcomes. Alternatively if the agricultural sector chooses not to advocate for these outcomes, in spite of society's expectations, other stakeholders will advocate in the industry's absence; and they will undoubtedly not choose the same path to these outcomes, to the detriment of Australia's farmers.

[26] National Farmers' Federation (NFF) (2006), *2007 NFF Pre-Budget Submission.*

[27] "The EPBC Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the Act as matters of national environmental significance". http://www.environment.gov.au/epbc/index.html <accessed 12.01.09>

[28] Since 2003 Australia's natural resource management has been delivered through fifty six regional resource agencies with their
boundaries broadly defined by watershed catchment regions. These bodies are variously known as Catchment Management Authorities (NSW and Vic), Regional Groups (Qld), NRM Groups (SA), Catchment Councils (WA), Regional Committees (TAS), the NRM Council (ACT) and the NRM Board (NT). http://www.nrm.gov.au/nrm/region.html <accessed 12.10.09>

Scheme Design

Federal and State Governments have largely driven the development and design of stewardship programmes to date, with input from their agricultural and environmental agencies. Other public sector agencies working in this field include the CSIRO and a number of universities[29] within their respective agricultural, environmental or natural resource faculties.

The preferred MBI model for the National Pilot Programmes previously run in Australia and for funding currently provided by regional resource agencies is price-based mechanisms utilising either tenders or auctions. Although this system enables the government to leverage their NRM spending, it does not necessarily maximise scheme participation or ensure that within a targeted ecological community, landholders managing ecosystems with the highest ecological attributes will participate. Landholders may choose not to enter into the programme if the cost-benefit does not warrant the investment of time and resources. Confidence in the market may also be undermined if through the tender/auction process participants, consciously or inadvertently, undervalue the true cost of providing their environmental services. This has the potential to distort market prices and the signals sent to participants, and may result in a reticence to participate.

Are price based MBI's, therefore, the most appropriate for Australian farmers? If so what are the impediments, if any, to widespread participation in such schemes? The Allen Consulting Group surveyed a broad range of farmers to identify factors that were preventing them from addressing environmental issues on their farms[30]. The results are indicative of the prevailing impediments to NRM participation today:

- 75% cited lack of funds;
- 67% cited low commercial benefits from spending;
- 61% cited government policy constraints;
- 38% cited lack of options with demonstrated success; and,
- 24% cited lack of information.

[29] These include the Australian National University, Charles Sturt University, University of New England, University of New South Wales, University of Queensland and University of Southern Queensland.
[30] Allen Consulting Group (2001:151), *Repairing the Country: Leveraging Private Investment*.

No single MBI will alone deliver sufficient uptake of stewardship initiatives and effect the changes necessary to ensure ecosystem preservation and resilience. A successful national scheme will need to draw on a suite of funding sources, and both exchange traded and customised instruments to provide a range of environmental goods and services across a highly variable landscape. To accomplish this will require robust, equitable and flexible national NRM policies.

International Case Studies

Most stewardship initiatives throughout the world, including Australia[31], continue to be funded by the taxpayer. These include programmes in the US such as the Conservation Stewardship Program (CSP)[32] and the UK's Environmental Stewardship Scheme (UKESS)[33]. The CSP is a whole-of-farm programme remunerating farmers for the delivery of stewardship services relating to soil, water, air, energy, wildlife and plants. Payments are made for the environmental benefits provided, the costs of delivering those benefits and the opportunity cost or income forgone by participating in the programme. In comparison the primary objectives of the UKESS are to conserve wildlife, maintain and enhance landscape quality and character, protect the historic environment and natural resources, promote public access and understanding of the countryside and protect natural resources. Land managers are paid for income foregone and can participate in three different stewardship schemes; Entry Level, Organic Level and Higher Level, with payments commensurate with the incremental environmental benefits delivered between each scheme.

There are, however, alternate ecosystem service models. Numerous innovative individuals and organisations have embarked upon collaborative initiatives to deliver ecological goods and services that are funded by the private sector; with the costs often passed on to the consumer. The following case studies, chosen for their potential to be adapted, in part or full, to the Australian landscape, highlight some of the work being undertaken in other countries.

[31] Australia's Federal Government has committed $2.25 billion to environmental programmes over the next five years under the *Caring for our Country* programme http://www.nrm.gov.au/funding/future.html#funding. In addition, tax concessions for capital and operating expenses are available to farmers undertaking landcare operations. Under s75D of the *Income Tax Assessment Act* (ITAA) capital expenditure for environmental purposes is deductible in the year of expense provided a certified property management plan has been completed http://www.ato.gov.au/businesses/content.asp?doc=/content/51586.htm. <accessed 15.10.09>

[32] Conservation Stewardship Program http://www.nrcs.usda.gov/programs/new_csp/csp.html. <accessed 15.05.09>

[33] Environmental Stewardship Scheme http://www.naturalengland.org.uk/ourwork/farming/funding/es/default.aspx. <accessed 15.05.09>

Water

Initiative: Watershed Agricultural Council.

Target: Water quality – nutrients.

Funding: User pays - New York City water utilities pass on costs to water ratepayers.

Key points: Voluntary, whole of landscape, flexible, farmer initiated, incorporating funding for capital expenditure including machinery and infrastructure.

Location: Catskill Mountains, New York State, USA.

Overview: Under the Clean Water Act New York City's nine million residents were faced with building a US$8.0bn water treatment plant with daily operating costs of US$1.0m[34]. Instead the city's residents pay farmers in its' two catchments a total of US$7.0m/year[35] to mitigate nutrient and pathogen runoff from their farms. The farmer initiated, science based, voluntary programme, receives technical support from the USDA (United States Department of Agriculture) and Cornell University. Non-traditional funding is available in the form of Nutrient Trading Credits, which can be allocated toward the capital cost of farm machinery and infrastructure that further mitigates nutrient and pathogen runoff. Farmers have also developed a "Pure Catskills" eco-brand to market the benefits of their fresh and environmentally grown local produce.

Initiative: Willamette Partnership.

Target: Water quality – temperature.

Funding: User pays – water utility and industry pass on costs to consumer.

Key points: Voluntary, delivers numerous ecosystem services, multi-partner coalition between farmers, industry and water utilities, subsequently developed ecosystem marketplace.

Location: Willamette Valley, Oregon, USA.

Overview: Given that water temperatures significantly impact riparian habitat and wildlife species, water resource agencies and industry were faced with US$60m in industrial upgrades to cool water prior to its release into streams and rivers within the catchment. Alternatively, farmers were paid US$10m to perform 56km of riparian remediation, which included planting streamside habitat, wetland restoration and floodplain reconnection. The Willamette Ecosystem Marketplace has since evolved to trade a range of ecosystem services.

[34] If the capital works and running costs were solely funded by residents this would equate to US$889 in capital costs and US$41 in annual running costs for each of New York's 9 million residents.

[35] This represents less than US80c per resident per annum in running costs, compared with US$41 under the alternate proposal to build the water treatment facility.

Habitat

Initiative: Operation Bumblebee.

Target: Bumblebee habitat.

Funding: Mixed. R&D - industry, incentives – government.

Key points: Voluntary, industry lead R&D, implemented on marginal farmland, significant multiplier effect.

Location: UK arable farmland (with pilot sites now in Portugal, Spain, France, Italy, Germany and Hungary).

Overview: Bumblebees are an important pollinator species and their decline poses a significant threat to UK ecosystems and food production. Research undertaken by agribusiness company Syngenta lead to the development of a pollen and nectar seed mix enabling the re-establishment of the bumblebee's food source. Farmers plant the mix on their marginal land including field boundaries and corners. They are paid UK£450/ha per annum through the government's stewardship programme and derive marketing benefits from food retailer Sainsburys. The initiative has succeeded in planting 1,000ha of habitat, which with a multiplier effect of every 1ha planted delivering 1,000ha of pollination services, has resulted in sufficient new habitat to provide pollination services to 25% of the UK's arable land. Jordan's Conservation Grade Farming is a similar UK initiative that pays farmers to manage 10% of their land for wildlife habitat. The farmers receive a price premium and two-year contract for their grain, which is sold as a range of breakfast cereals.

Initiative: Mitigation Banking.

Target: Wetlands and aquatic habitat.

Funding: User pays – developer or utility pass on costs to consumer.

Key points: driven by "no net loss" policy, perpetual conservation easements, entrepreneurial environmental solutions, efficient use of market resources.

Location: Numerous states, USA.

Overview: Mitigation banking originated for the protection of wetlands and aquatic habitat following the advent of "no net loss" regulations. The concept has since been broadened to encompass a range of other ecosystems including critical habitat for threatened and endangered species. The entity removing or altering the habitat, typically a property developer or utility undertaking an infrastructure project, such as laying a gas pipeline or widening a freeway, must acquire a certified offset of the same ecological community, of equal ecological value. Mitigation bankers have emerged as environmental entrepreneurs to whom developers transfer responsibility for the successful management and long-term protection of these

compensatory ecological sites. Mitigation banks are reported to generate a 30%-50% return through restoration, creation, and preservation practices.

Wildlife

Initiative: Ducks Unlimited.

Target: Conservation of wetland habitat for waterfowl.

Funding: Mixed. Government programmes, conservation easements, membership and merchandise.

Key points: Extensive habitat preservation, multi-partner initiatives, provides environmental and recreational services.

Location: United States, Canada, Mexico.

Overview: Ducks Unlimited (DU) was established in 1937 to protect waterfowl wetlands, particularly breeding, migration and wintering habitats throughout Canada and the US for the benefit of recreational hunters. Today it has over 780,000 members, annual revenue in excess of US$260m and has conserved 5.2m ha of wetland habitat[36]. It is one of the world's largest and most successful organisations committed to habitat conservation having raised over US$2.96bn in funds since inception. A similarly motivated organisation, Trout Unlimited (TU) seeks to conserve, protect and restore trout and salmon fisheries throughout the US. It undertakes restoration practices on public and private land aimed at rebuilding natural resilience, ranging in scale from streams through to watershed level. Established in 1959 it has 156,000 members and annual revenue of US$21m derived from membership, state and federal grants, and investments[37].

Initiative: Red Wolf ecotourism.

Target: Preservation of red wolf population.

Funding: User pays – ecotourism.

Key points: Private landholders contribute to public wildlife conservation goals, boost to regional economy and employment.

Location: Northeastern North Carolina, USA.

Overview: Red wolves were declared an endangered species in 1967, declared extinct in the wild in 1980, but successfully bred in captivity and released into Alligator River National Wildlife Refuge in 1987. The return of the wolves has boosted tourism, attracting people to

[36] Ducks Unlimited (2008). *Annual Report and Financial Statements.* http://www.ducks/org. <accessed 15.09.09>

[37] Trout Unlimited (2007). *Trout Unlimited, Inc: Financial Report, September 30th, 2007.* http://www.tu.org/. <accessed 15.09.09>

participate in wolf education programmes, nature tours and guided wolf "howlings". A pilot study has established that visitors would be prepared to pay $5/hd to visit a proposed Red Wolf Centre, generating an estimated US$1.0m per annum from entrance fees alone. Farmers are being encouraged to deliver ecosystem services by preserving red wolf habitat. This resonates with local community interests, which aim to foster economic growth and youth employment within traditionally poor counties. Recommendations for implementing a market based incentive scheme are still being developed.

Carbon Credits

Initiative: Agricultural carbon offsets (various).

Target: Carbon credits.

Funding: Corporate sector.

Key points: Voluntary (CCX) and mandatory (Alberta) markets, agricultural offsets from non-forestry practices for all six major greenhouse gases.

Location: United States and Canada.

Overview: Alberta is Canada's first province to introduce a mandatory emissions trading scheme, which seeks to regulate large emitters (more than 100,000t CO_2e/yr[38]). Three options are available to entities required to account for their emissions, the first two are technological solutions. The third option is the purchase of "Alberta made" carbon offset credits, which under the legislation can only be derived from agriculture or forestry. This has created a market for farmers to trade carbon offsets generated through biological means such as tillage practices, biomass, biofuels, afforestation, composting, nutrient and manure management. The Chicago Climate Exchange (CCX) was the world's first voluntary trading system, with projects worldwide, trading all six major greenhouse gases (GHGs). Agricultural offsets include soil sequestration through conservation tillage, grassland conversion and sustainable rangeland management[39]. Both CCX and Alberta have developed protocols that acknowledge the highly variable nature of agricultural emissions, addressing issues of rigour, transparency and integrity within an industry characterised by significant seasonal and economic fluctuations.

[38] "CO_2e" is the internationally recognised measure of green house gas emissions equivalent to one tonne of carbon dioxide.

[39] Chicago Climate Exchange (2009). *Chicago Climate Exchange General Offset Program Provisions.*

Biofuels/Renewables

Initiative: Jatropha plantations.

Target: Biofuels, carbon credits, biodiversity.

Funding: Varies on location, includes government and corporate projects, plus public private partnerships.

Key points: Potential to outperform other oilseed crops, grown on marginal farmland, delivers multiple products.

Location: South East Asia, Africa, South America.

Overview: *Jatropha curcas* is an inedible 2m high shrub, producing oil from its seed suitable for biodiesel. Indian plantations are predominantly in marginal farmland, often owned by the village, or in degraded forest. Sale of the seed generates income for these subsistence farming communities and the biomass, including prunings, can be burnt for fuel or biomass power generation. Mature shrubs have the potential to provide carbon credits, contribute to biodiversity in degraded forests and mitigate erosion. However, initial reports that drought resistant jatropha was the solution to biofuel needs, and would not need to be grown on land currently producing food crops, have since been tempered by variable results, in large part due to the plant having not been domesticated. Further research is considered necessary, despite which the airline industry is enthusiastically supporting the initiative having recently flown planes on a blend of jatropha biodiesel and Jet A1 fuel[40].

Initiative: Samsø Renewable Energy Island.

Target: Renewable energy, carbon emissions.

Funding: 93% private, 7% government.

Key points: Community initiated, self sufficient in renewable energy, selling green energy and carbon credits.

Location: Samsø Island, Denmark.

Overview: In 1997 the Danish government called for expressions of interest from communities willing to demonstrate a 100% transition to complete self-sufficiency with renewable energy within ten years. Samsø, a 144 sq km island, known largely for its agriculture and tourism was awarded the project. Using a combination of windmills, central heating plants, biomass and solar generation, it successfully converted to 100% renewable energy. The project was predominantly funded by the islands' 4,100 inhabitants, costing €14,000 per person (93%), with the government contributing €1,000 per person (7%). A

[40] Air New Zealand, 30th December, 2008. http://www.ens-newswire.com/ens/dec2008/2008-12-30-02.asp. <accessed 15.09.09> Continental Airlines, 7th January, 2009. http://phx.corporate-ir.net/phoenix.zhtml?c=85779&p=irol-newsArticle&ID=1241576. <accessed 15.09.09>

small-scale biodiesel plant has been developed using canola seed, with the high protein "cake" bi-product fed to livestock. Samso's per capita carbon footprint has reduced 15.1 tonnes, from 11.1 tonnes to -4.0 tonnes per person, enabling the sale of carbon credits[41].

Table 2: ***Leading International Stewardship Initiatives***.

	USA	Canada	UK	Demark	India
Water	Watershed Agricultural Council				
Habitat	Mitigation Banking		Jordan's Conservation Grade Farming		
Wildlife	Ducks Unlimited		Operation Bumble Bee		
Carbon		Alberta Carbon Offset Market			
Renewables				Samsø: Renewable Energy Island	
Biofuels				Samsø: Renewable Energy Island	Jatropha[42]
Conservation covenants	The Nature Conservancy, Ducks Unlimited				

Australia has a number of individual schemes that are mostly confined to a local level and are therefore, yet to demonstrate economies of scale.

[41] PlanEnergi et al., (2007), *Samsø, A Renewable Energy Island: 10 Years of Development and Evaluation.*

[42] Jatropha is not only grown in India. Private sector and government plantations are found throughout developing countries in south-east Asia, Africa and South America, where labour remains cheap given that mechanised harvesting techniques are yet to be developed.

Policy Considerations

Australia has the opportunity to lead the world in implementing a market based environmental services scheme as a cornerstone of a national climate change initiative incorporating an Emissions Trading Scheme (ETS). An effective and sustainable stewardship scheme should be capable of delivering carbon, water, biodiversity, soil and salinity credits: ecological goods and services.

To avoid the shortcomings of former initiatives a national ecosystem services scheme is required. It should be private sector funded/consumer pays, applied as a whole-of-landscape approach, voluntary, implemented on marginally productive land, and paid as a performance-based, annual cashflow stream provided that the farmer continues to deliver the environmental benefits to a standard of peer reviewed industry best management practice which are over and above their environmental duty-of-care. The benefit to the Australian Government, land managers and society is the most cost effective delivery of ecological goods and services.

Competing Land Use Demands

Policy, particularly surrounding emissions trading, must not be made in isolation of other equally critical, inextricably linked, global issues. A balance is required between food security, climate change initiatives (including biofuels) and ecosystem preservation. Central to the vexed question of appropriate land use are Australia's farmers who are vital to both the national economy and the success of an ESS. They manage 61% of the Australian landmass, produce 93% of Australia's domestic food supply, underpin 12% of GDP, and employ 17% of the national workforce[43]. Consequently, Australia cannot afford to relinquish its food security, or its food sovereignty; Australia's ability to be self sufficient in meeting its domestic food supply, solely in pursuit of an all-inclusive ETS.

A national stewardship scheme must be equitable, remunerating land managers who deliver ecosystem benefits above their "environmental duty-of-care". Agriculture, being predominantly a "price taker", is unable to pass the costs of environmental works on through the supply chain, despite which it should not have to bear a disproportionate environmental cost burden to enable other sectors to continue operating on a "business as usual" basis.

[43] National Farmers' Federation (2008). *Farm facts*: www.nff.org.au/farm-facts.html. <accessed 12.01.09>

Approximately 80% of the Australian population live in cities and 85% within 50km of the coast[44], less affected by the physical realities of climate change, ecosystem decline and natural resource management. They will, however, need to be educated as to the true cost of providing ecosystem goods and services. As these costs are rarely reflected in the price of consumer goods, a long-term policy goal must be consumer contribution toward maintaining those environmental services that benefit all the community.

Scheme Design

Effective MBI design is critical to incentivise the efficient operation of a national ESS. In order to capitalise on the ability of farmers to provide cost-effective solutions, as seen with New York's Watershed Agricultural Council (case study 1), the Australian Government needs to provide enabling legislation, allow a dedicated lightly regulated non-government organisation to administer the scheme and the private sector to develop and drive an innovative and sustainable ecosystem marketplace. This would enable ecosystem management to move beyond the current piece meal approach, with initiatives funded beyond traditional three-year cycles and address the issue of ecosystems and their services crossing spatial boundaries.

Agriculture's appetite to participate in an ongoing scheme will be influenced largely by cost-benefit analysis, together with instrument complexity, transaction costs, contractual property rights, liability periods and scheme flexibility within an industry characterised by significant seasonal and economic fluctuations. Sovereign risk[45] also has the potential to undermine agriculture's participation in stewardship initiatives. It will need to be acknowledged and adequately addressed by scheme architects if they are to optimise ESS participation.

Within these parameters, all stakeholders including government, land managers, private enterprise, environmentalists and consumers must be flexible in developing realistic, cost effective, practical and sustainable solutions. Stakeholder flexibility was repeatedly identified as one of the key components to the successful design and implementation of the Watershed Agriculture Council's solution to New York's water quality issues.

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[44] Australian Bureau of Statistics (2008), *3218.0 - Regional Population Growth, Australia, 2006-07*. www.abs.gov.au/. <accessed 03.02.09>

[45] "Sovereign risk is the risk of the State using its power to alter the established rights of private sector companies. It is a risk to private sector participants that a project's implementation may be hindered or prevented, or its operation adversely affected…", Vigar, C (2006) http://www.minterellison.com/public/connect/Internet/Home/Legal+Insights/Newsletters/Previous+Newsletters/A-A-Parrots,+politics+and+policy. <accessed 12.10.09>

Research and Development

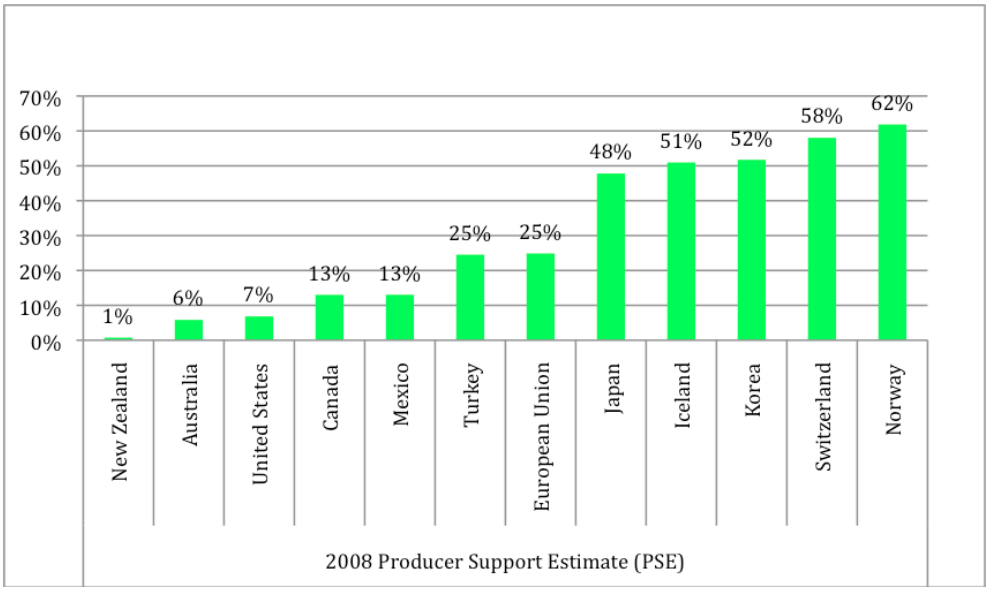
Australian agriculture's capacity to provide sustainable ecosystem services, deliver food security and remain globally competitive must be underpinned by leading relevant R&D. Projects however will need to be adequately funded, appropriately targeted, capable of commercial application and delivered through coordinated extension programmes. This approach has been instrumental in the success of Operation Bumblebee (case study 3) and is subsequently being replicated in the six additional countries piloting the programme in Europe.

To date Australia's R&D investment in measuring and valuing environmental benefits has been insufficient. Repeated Government funding cuts continue to perpetuate the problem at a critical juncture in the management of the nation's ecosystems. Europe and the United States, by comparison, have a much stronger culture of R&D investment and philanthropy. Consequently, stewardship programmes and ecosystem schemes are more diverse and innovative in these countries, and their uptake is often more advanced.

However, many of Australia's trade competitors subsidise their agricultural sector significantly, placing Australian farmers at a distinct commercial disadvantage (see Table 3: *Agricultural Subsidies as a Percentage of 2008 Farm Income*). Under the European Union's Common Agricultural Policy (CAP) €56bn, 42% of their €134bn 2009 budget, has been allocated to direct and indirect payments for European farmers[46]. The United States 2008 Farm Bill (The Food, Conservation and Energy Act of 2008) commits to payments of US$287bn between 2008-20012, with farm support programmes in the form of direct payments, marketing loans, crop insurance and "counter-cyclical" payments; the latter being a price and production support scheme[47].

[46] European Commission (2009), *General Budget of the European Union for the Financial Year 2009*.
[47] Congressional Research Service (2008), *Farm Bill Legislative Action in the 110th Congress.* http://opencrs.com/document/RL33934/. <accessed 12.09.09>

Table 3: ***Agricultural Subsidies as a Percentage of 2008 Farm Income*** **(OECD, 2009)**



However, environmental programmes may be the beneficiaries of World Trade Organisation (WTO) pressure on the distortionary effects of agricultural subsidies. Increasingly both the US and EU are realigning their subsidy programmes, in order to perpetuate producer payments, through WTO compliant "green box"[48] mechanisms such as environmental or ecosystem service payments. The EU has started to "decouple" farm payments from production moving toward rural development and agri-environmental schemes. Farmers are eligible to receive these payments for meeting cross-compliance obligations relating to animal welfare, environmental practices and food safety. The US has also moved to decouple payments, announcing a stronger commitment to environmental stewardship programmes through the 2008 Farm Bill with increasing emphasis on landscape scale initiatives.

A strong and ongoing commitment to R&D is, therefore, critical for Australian farmers, as they are reliant on productivity gains and efficiencies to remain globally competitive. Given that payments under the proposed ESS will reward performance and not practice, additional R&D is also vital to garner Australian business and consumer confidence in agriculture's capacity to provide measurable ecosystem services. This confidence will only eventuate if backed by proven scientific research, addressing issues of rigour, transparency and integrity. Government and the private sector will need to work collaboratively to provide the required R&D support, with funding provided through either tax concessions or grants.

[48] "green box subsidies must not distort trade... They have to be government-funded (not by charging consumers higher prices) and must not involve price support." http://www.wto.org/english/tratop_e/agric_e/agboxes_e.htm. <accessed 17.10.09>

Education

Ecosystem service schemes are a not widely understood within the farming sector. To maximise the uptake of the proposed initiative land managers will need to be educated and provided with demonstrable working examples of the scheme's application. Within this context, participant's expectations must be managed, as unmet expectations have the capacity to significantly compromise long-term scheme participation and outcomes.

Similarly if participants are not well informed and do not possess genuine ownership of the scheme, irrespective of how well formulated and ideologically sound it may be, the programme will deliver lack lustre results and eventually fail. Prior to deciding whether to support a national stewardship initiative, or specific stewardship schemes, the agricultural industry must be informed of the alternative MBI options that are being used internationally and the manner in which international landholders participate in their respective programmes.

Australian farmers are extremely innovative, quickly adopting new technologies and sustainable farm practices once confident in their ability to deliver triple bottom-line benefits. To ensure that benefits are realised for all ESS stakeholders, farmers must be provided with the appropriate skills and knowledge to implement, manage and report on the delivery of ecosystem services provided under their management.

Continuity

Despite both State and Federal Governments embarking on a number of pilot environmental stewardship schemes, these nascent programmes and the institutions[49] that support them have repeatedly suffered at the hands of capricious governments. Consequently, there has been a resultant loss of continuity, market confidence, stakeholder engagement, corporate knowledge and national oversight of the collective work that has been and is being undertaken.

A robust and sustainable stewardship model requires a national ESS. It should bring together thought leaders, innovators and change agents from the sciences, environment, government, agriculture, civil society and indigenous organisations to develop a framework for a *National Stewardship Initiative*. This should include a National Stewardship Centre, where individuals and institutions contribute to ecosystem solutions and knowledge through innovative, interdisciplinary approaches to applied research, development, extension, practice and market engagement.

[49] Land and Water Australia, CSIRO, State and Federal Departments of Agriculture, Landcare, National MBI Capacity Building Programme, Environmental Services Scheme.

Legislative Considerations

While the Australian legislative and legal implications are beyond the ambit of this paper, it is envisaged that legislative considerations should address issues of; food security, competing land use demands, public versus private good, adaptive capacity, biosecurity, environmental regulation, investment incentives, property rights, research and development needs, taxation framework, drought policy, and rural and regional resilience.

Legislative Reform

Governments have numerous opportunities to create enabling legislation that can underpin a national market based stewardship scheme. To create an effective ESS it is recommended that regulation and legislation facilitate and not impede the establishment of stewardship schemes. The Federal Government currently has before it initiatives to establish, reform or review; an emissions trading scheme, water entitlements and water efficiency, the Environment Protection and Biodiversity Conservation Act (EPBC), the Income Tax Assessment Act, superannuation legislation, Managed Investment Schemes, Farm Management Deposits, the Goods and Services Tax (GST), and the "Caring for our Country" programme. Within each of these key legislative frameworks, the Government can provide clear signals and certainty to the market regarding its commitment to remunerate land managers who deliver public environmental goods and services.

Property Rights

Entering into stewardship agreements often give rise to contractual obligations and increasingly a registration or covenant on property title. Conservation easements have emerged in the US as an integral tool in conserving environmental attributes on private farmland. Landowners voluntarily donate or sell certain property rights, which limit some land use practices, and prevent development, including subdivision, in perpetuity. They are paid the difference between the development value and the agricultural value of their land, providing capital, which can be invested back into the farm and environmental initiatives, into additional farmland or off-farm. Land managers are able to continue farming and forestry practices within the terms of the easement, but may have to protect certain ecological communities through changed land management practices such as fencing riparian areas and excluding livestock. Once covenanted the land can only be sold for its agricultural value, as

the landowner has already been paid for the foregone development value, the opportunity cost, and no development is permitted[50].

Compared with the US, Australia does not have the same population density and widespread development pressures, which underpin demand for rural land. With 80% of the population living in cities and 85% within 50km of the coast[51], conservation covenanting has predominantly been concentrated along Australia's east coast and those inland areas surrounding major metropolitan centres experiencing significant peri-urban sprawl.

Australia's uptake of covenanting has been through similar vehicles known as conservation covenants or agreements. The promotion and administration of which is largely managed by quasi non-government organisations (Quangos), to which State Governments have devolved power. These comparatively young organisations include the Nature Conservation Trust in NSW, the Trust for Nature in both Victoria and Queensland and the Tasmanian Land Conservancy in Tasmania.

Relative to the United States, limited productive Australian farmland has been placed under conservation covenants, with the focus primarily on marginally productive, high value ecological communities. This is in part due to the State organisations listed above not having the financial resources to purchase and continually hold large portfolios of covenanted land. Consequently, a number of these Quangos have developed revolving funds through which they purchase, covenant and on-sell environmentally significant land. Larger up-take of the scheme may eventuate if the market matured to pay landholders wishing to continue farming, the difference in value between the development and agricultural use of their land.

However, with increasing demands on State Governments to access significant mineral resources beneath prime agricultural land, the binding "in-perpetuity" nature of covenants would need to be widely tested in the courts. The agricultural sector will continue to remain wary of sovereign risk and concerned that the covenant may be overturned to allow mining or development to occur. Should this occur it would clearly compromise the landowner's intent of entering into the covenant and the integrity of the covenanting initiative.

[50] The Nature Conservancy (2009). *Conservation Easements: Conserving Land, Water and a Way of Life.* http://www.nature.org/aboutus/howwework/conservationmethods/privatelands/conservationeasements/. <accessed 12.09.09>

[51] Australian Bureau of Statistics (2008), *3218.0 - Regional Population Growth, Australia, 2006-07*. www.abs.gov.au/. <accessed 03.02.09>

Economic Considerations

No single market instrument or funding stream can deliver whole-of-landscape scale uptake of stewardship initiatives. A successful national scheme will need to draw on a suite of funding sources and mechanisms with the ability to be easily and effectively adapted across a highly variable landscape.

The Australian Conservation Foundation (ACF)[52] in recognising the essential role that market based stewardship schemes can play highlight that a "significant increase in the size of the stewardship program….would provide economies of scale and scope, increasing the outcomes achieved and the environmental return per dollar"[53]. Furthermore, they state that;

> *"stewardship payments are an essential part of the next generation of environmental governance arrangements, supported by enhanced planning and regulation, better national decision support, and more widespread use of market based resource management policies"*[54]

User Pays

Under the proposed ESS set out in this paper, a move to consumer funded stewardship schemes would be a major paradigm shift in the delivery of Australia's NRM initiatives. While potential funding sources will be discussed later, it is proposed that consumers, through the purchase of goods and services such as food, water, electricity and fuel, would create a funding stream to be redirected back to land managers delivering ecosystem services above their environmental duty of care. These funds would pay for NRM programmes that deliver measurable results, rewarding performance, not practice, unlike many of the prevailing schemes employed by government agencies in Australia and throughout the world.

It is envisaged that private sector businesses will largely act as intermediaries, passing on the cost of funding environmental works on a "user-pays" basis. Emissions Trading Schemes are already using this approach for pricing in carbon costs. Similarly, the Watershed Agricultural Council and New York City pass on stewardship costs to New York's water users through the city's water utility providers. Importantly a user-pays approach ensures that the environmental costs of delivering a product are internalised into the price of goods purchased by consumers. Presently most environmental costs are externalised, with markets failing to price these into

[52] ACF is one of Australia's major community-based environmental advocacy groups. http://www.acfonline.org.au/default.asp. <accessed 12.09.09>

[53] Hatfield-Dodds et al., (2008:30). *Delivering on the Promise of Stewardship: Issues in realising the full potential of Environmental Stewardship Payments for landholders and the land*.

[54] ibid (2008:30)

the true cost of production and consequently their sale price. As an example, the cost of packaging and waste disposal from consumer goods is borne by the community, so too are the costs of road damage and pollution arising from increased heavy vehicle road use.

The private sector will understandably require a clearly defined cost-benefit in a user-pays scenario prior to embedding stewardship costs into the prices charged for their goods and services. Similarly, land managers will seek surety that they too receive tangible cost-benefits before embarking on changes to their land management practices, including payment for;

1. the environmental benefits delivered,
2. the cost of delivering those benefits, whether they be operational or capital expenditure, and
3. the opportunity cost of forgone income from the land committed to the stewardship initiative/s.

In short, "all proposed environmental policies, plans and practices should be subject to rigorous analysis of social and private costs and benefits"[55].

Funding Opportunities

Architects of the next generation of stewardship schemes need to consider complementary incentives, including mitigation banks, cost-share agreements, safe-harbor agreements[56], tax credits, revenue sharing and those incentives that complement private markets[57]. Australia has a number of institutional and regulatory frameworks that should be critically examined to determine if they are both suitable and capable of providing funding or effecting positive change in land management practices. Far from being an exhaustive list, Australia should undertake a detailed cost-benefit analysis of the following potential funding opportunities;

1. including GST on all food[58] and using these revenues to fund the ESS;
2. enabling regulated industries to pass-through stewardship costs to consumers;
3. increasing the tax deduction for superannuation funds investing in stewardship schemes;
4. providing an exemption from stamp duty on purchases of land managed under the ESS;
5. providing an exemption from capital gains tax on sales of land managed under the ESS;

[55] Australian Farm Institute (2008), *Estimating the Value of Environmental Services Provided by Australian Farmers.*

[56] Safe Harbor Agreements provide assurances to private landowners, who voluntarily enter into an agreement to restore and maintain habitat for endangered species that they will not incur additional regulatory obligations in excess of those that existed at the time of entering into the agreement. This seeks to allay landowners' concerns that increasing an endangered species habitat and population will lead to increased land use restrictions. Environmental Defense Fund, http://www.edf.org/article.cfm?ContentID=399. <accessed 12.10.09>

[57] Casey (2008), *Creating Economic Opportunity Through Ecotourism/Ecosystem Services in North Carolina*.

[58] The GST is not levied on fresh and unprocessed food in Australia.

6. granting relief from local government rates for land delivering stewardship services;
7. investment by the Australian Government's Future Fund, consistent with its Investment Mandate[59]; and
8. making income derived from private sector funded environmental programmes tax-free.

These suggestions should be comprehensively reviewed and not dismissed merely for political expediency.

In creating a conducive taxation and investment environment, it is critical that the distortionary impacts and problems inherent in Australia's agricultural Managed Investment Schemes (MIS) are not replicated. These tax driven pooled schemes, have primarily invested in plantation timber and orchards, with investors often more focussed on the taxation benefits, than the profitability or sustainability of the enterprise. They allow the investor full tax deductibility for capital expenditure, a concession not available to non-MIS primary producers. This has created investment opportunities that have significantly impacted regional hydrology and downstream water use, distorted market signals and investment decisions, and through the displacement of families formerly involved in farming the MIS land, severely undermined local communities and associated services, such as schools and hospitals which require a critical mass to employ staff and remain operationally viable.

Investment in stewardship schemes may come from a range of institutional and individual participants. Environmental fund managers, for example Green Investment Funds, Eco Investment Funds, Ethical Investment Funds, Sustainable Investment Funds, collectively have the potential to be significant market contributors; provided they can meet investors' return requirements.

They may purchase a property to preserve or enhance remnant vegetation with a high ecological value, place a management covenant on the remnant, and lease out the productive area of the property to a neighbouring farmer to crop or run livestock. In this scenario, the Fund's financial return would comprise lease income from the productive area, mitigation banking income from the remnant, carbon credits from land reclamation work on highly erodible soils and capital growth from the entire property.

[59] The Future Fund was created by the Australian Government to meet the cost of unfunded public sector superannuation by managing invested monies and growing its asset base. Contributions to date have been from Government budget surpluses and the sale of Telstra shares, previously transferred to the Fund, and formerly held by the Federal Government. The Fund's long-term asset allocation allows up to 15% of the portfolio weighting to be invested in alternative assets. As at the 30 September 2009 the balance of the Fund was AU$64bn. http://www.futurefund.gov.au/ <accessed 05.11.09>

Ecosystem Risk

"There are risks and costs to a program of action. But they are far less than the long-range risks and costs of comfortable inaction."

John F.Kennedy

Risks associated with ecosystem decline can be broadly grouped into environmental, regulatory, economic, human health and wellbeing, and reputational. Loss of ecosystem resilience and function, rapid climate change, reduced sustainability, diminished adaptive capacity and increased environmental cost are risks that are common to all major ecosystem service stakeholders: being government, land managers, private enterprise, environmentalists and consumers.

Stakeholder Risks

Of the twelve risks identified at Table 4: *Stakeholder Risks from Ecosystem Decline*, all are common to government, land managers, private enterprise and consumers (with the exception of reputational risk for consumers), indicating that there is significant mutual interest in achieving cost effective, tangible and enduring outcomes.

Table 4: ***Stakeholder Risks from Ecosystem Decline.***

Risk	Government	Land Managers	Private Sector	Environmental Groups	Society and Consumers
Loss of ecosystem resilience	✔	✔	✔	✔	✔
Loss of ecosystem function	✔	✔	✔	✔	✔
Rapid climate change	✔	✔	✔	✔	✔
Reduced sustainability	✔	✔	✔	✔	✔
Reduced productivity	✔	✔	✔		✔
Reduced profitability	✔	✔	✔		✔
Diminished adaptive capacity	✔	✔	✔	✔	✔
Increased regulation	✔	✔	✔		✔
Increased costs - economic	✔	✔	✔		✔
Increased costs - social/community	✔	✔	✔		✔
Increased costs - environmental	✔	✔	✔	✔	✔
Reputational risk	✔	✔	✔	✔	

The Millennium Ecosystem Assessment (MA) identified that human wellbeing is bounded by the benefits of resilient ecosystems. Furthermore, the MA estimates that 38% of ecosystems have undergone transformation in the last fifty years and that a continued decline in ecosystem resilience and function, will present considerable, ongoing risk to humanity[60]. This decline has been driven by the increased demand of other services arising largely out of population growth and increasing affluence;

> *"the supply of certain ecosystem services has increased at the expense of others. Significant gains in the provision of food and fibre have been achieved through habitat conversion, increased abstraction and degradation of inland waters, and reduced biodiversity"* [61]

Inertia

Within this context, a continued reduction in ecosystem diversity will threaten a system's resilience, which will lead to a loss of function and diminish service delivery. This has the potential to significantly impede society's capacity to function on a "business as usual" basis, with flow-on political ramifications and conflict. Despite which there is considerable risk of inertia, in part from ecosystem decline not being perceived as a significant problem, but also arising from the phenomena Garrett Hardin defined as the *Tragedy of the Commons*[62].

Hardin proposed that multiple individuals acting independently in their own self-interest could degrade and ultimately destroy a shared ecological resource even though it is clearly not in anyone's long-term interest for this to happen. Drawing on the metaphor of cattle herders grazing on community common land (Commons), he noted that rational herders will individually seek to maximise their financial gain by grazing as many animals as possible, while the environmental costs of overgrazing are collectively shared by all users of the Common. Other examples of Commons that have been exploited include the world's fish stocks and pollution, which is an inverse situation of putting waste and chemicals back in to the Common, an action that also collectivises the cost of addressing the problem[63].

However, numerous stakeholders with divergent expectations and strategic goals may also lead to the risk of inertia. Inaction could, therefore result in a greater need to retrofit the environment, an undertaking Australia is currently attempting with carbon emissions and water entitlements. This will prove expensive, both in terms of the economic, social

[60] United Nations (2005:15), *Millennium Ecosystem Assessment: Ecosystems and Human Well-being: Current State and Trends*.
[61] ibid (2005:6).
[62] Hardin (1968). *The Tragedy of the Commons.*
[63] ibid (1968:1245).

(including human health) and environmental costs, together with the significant structural adjustments required to effect these outcomes.

Debate surrounding appropriate levels of NRM have and will continue to range widely, evoking strong and at times polarised opinions. Proponents predicting more catastrophic environmental outcomes are often informed by Malthusian[64] beliefs that rapacious demand, driven by over-population, will eventually outstrip the world's natural resources. Conversely, economic rationalists advocate that the free market and human ingenuity will respond to market signals, providing the most cost-effective delivery of environmental goods and services[65].

Increasingly these groups, and those positioned in between, will need to focus on their common aspirations and collaborate in working toward realising their shared goals. Material gains and the economic benefits of ecosystem preservation can be achieved if, as stated previously, stakeholders are prepared to be flexible in their approach to the development of realistic stewardship outcomes.

[64] Thomas Malthus was an influential British scholar and Anglican clergyman, who in his 1798 work *An Essay on the Principle of Population*, hypothesised that an "endless progress toward a utopian society" was a flawed premise because population growth would invariably be checked by the earth's inability to sustain the population, leading to famine, disease and widespread mortality. http://www.1911encyclopedia.org/Thomas_Robert_Malthus. <accessed 09.09.09>

[65] Free market environmentalists advocate that the free market and property rights, supported by tort law are the most cost-effective way to protect the environment (Anderson et al, 2001).

Australian Farm Scenarios

Australia has a large variety of ecological habitats functioning within an equally diverse range of farming systems. With over 60% of the Australian landmass being used for agriculture, a stewardship scheme that rewards farmers for protecting and enhancing the environment is central to preserving Australia's ecosystems.

Australian agriculture can be divided in three zones; high rainfall, the wheat belt and pastoral. Each of which are able to deliver ecosystem services of varying types, quality and quantities. As less than 1% of Australia's farmland is irrigated, the majority of stewardship initiatives will need to be capable of application, and delivery of services, in rain-fed temperate grasslands or semi-arid rangelands.

Revenue streams in these areas may primarily revolve around carbon credits for soil sequestration and tree plantations. To a lesser extent, income might be derived for preserving habitat through mitigation banking initiatives, such as BioBanking in NSW and BushBroker in Victoria. These however, would be more prevalent in coastal regions where most urban development and ecosystem loss is occurring. Water related incentives might be derived from riparian plantings to stabilise stream banks and reduce sediment loads, or metropolitan water utilities paying for nutrient mitigation practices in watersheds that feed their water storages or "wetland" conservation banks in areas with higher rainfall.

As previously discussed, participation by farmers in delivering these ecosystem services would be based on the cost benefit of the activities undertaken. The costs associated in delivering these outcomes will include both operating and capital costs, plus the opportunity cost or income forgone by participating in the programme.

The following three scenarios are intended to illustrate the types of stewardship initiatives that might be undertaken in each of Australia's three agricultural zones. Although Australian agricultural land is held under a variety of different ownership structures, the family farm, institutional investors and government have been selected to reflect some of the entities that currently hold and manage land. Given that insufficient resources have been applied to measuring and costing most of Australia's ecosystem services, the figures contained in the scenarios are for illustrative purposes only and should not be construed as accurately reflecting, in absolute terms, the cost-benefit of these hypothetical farming situations.

Scenario 1: Mixed Enterprise (Family Farm)

Assumptions

Zone: High Rainfall (>500mm per annum).

Area: 1,500ha.

Productive: 85%, livestock and cereals (5% of area limited by salinity and water logging).

Remnant: 10%, capable of being restored to a high conservation value ecological remnant.

Riparian: 5%, with all tributaries flowing to a major river system.

Other: one permanent stream running through the farm carries good fish stocks.

Enterprises: sheep, cattle, cropping.

Gross Margin[66]: livestock - $20/DSE (dry sheep equivalent).
cropping - $200/ha.
saline/water logged - breakeven i.e. $0/ha.

Management Strategy: invest for the long-term, seek to pass the property on to the next generation.

- Productive land: maximise food and fibre production from livestock, cropping and fodder production.
- Production limited: plant the area to fast growing species that are tolerant of salinity or water logging and suitable for biofuel production, carbon sequestration, or as with Operation Bumble Bee, plant species to create the preferred habitat for threatened wildlife.
- Remnant vegetation: enhance biodiversity and ecological value using judicious time controlled grazing.
- Riparian: reduce erosion, sedimentation and nutrient loads in waterways by establishing buffer strips adjacent to creeks and rivers by planting native trees and shrubs, and encouraging native pastures.
- Fish stream: enhance streamside habit, through plantings and limiting livestock access, to encourage fish stocks to increase and enable sustainable fishing.

[66] Gross margin figures are based on figures taken from the NSW Department of Primary Industry's farm budgets and costs http://www.dpi.nsw.gov.au/agriculture/farm-business/budgets. <accessed 05.11.09>

Potential Funding

- Productive land: generate gross margins of $20/DSE from livestock and $200/ha from arable land.
- Production limited: biofuel companies, carbon trading or wildlife mitigation banks.
- Remnant vegetation: mitigation banks.
- Riparian: water utility (similar to the New York Watershed Agricultural Council), carbon trading.
- Fish stream: individuals prepared to pay for recreational fishing, for example fly fishing camps.

Table 5: ***High Rainfall Zone Ecosystem Services.***

Land type	Ecosystem services					
	Food & Fibre	Biodiversity	Water	Biofuels	Carbon	Recreation
Productive	✔				✔	
Saline/water logged		✔		✔	✔	
Remnant		✔				
Riparian			✔		✔	
Other - stream						✔
	Funded by					
Productive	Consumer				ETS: soil	
Saline/water logged	Mitigation bank			Fuel company	ETS: soil	
Remnant	Mitigation bank					
Riparian			Water utility		ETS: trees	
Other - stream						Fishing

Scenario 2: Wheat Sheep Property (Institutional Investor/Green Fund)

Assumptions

Zone: Wheat Belt.

Area: 10,000ha.

Productive: 90%, livestock (30%), irrigated and dryland cereals (60%), rocky ridge through centre of property.

Remnant: 6%, high conservation value ecological remnant.

Riparian: 4%, perennial wetlands, habitat for a number of endangered species.

Other: increased kangaroo and feral animal numbers are reducing production and damaging remnant vegetation.

Enterprises: sheep, cattle, cropping.

Gross Margin[67]: livestock - $18/DSE (dry sheep equivalent).
cropping - $142/ha,
irrigated – $265/ha.

Management Strategy: invest for 7 – 8 years, seeking returns 2-3% above long-term Government bond rate.

- Productive land: maximise food and fibre production from livestock, plus irrigated and dryland cropping.
- Rocky ridge: plant area to native species that are suitable for biofuel production or carbon sequestration.
- Remnant vegetation: enhance biodiversity and ecological value using judicious time controlled grazing.
- Riparian: reduce erosion, sedimentation and nutrient loads in waterways by establishing buffer strips.
- Riparian wetland: enhance wetland ecology using irrigation water. This would clearly be subject to a cost-benefit analysis, comparing the returns between irrigated cropping and wetland preservation.
- Kangaroos: control kangaroo numbers using a professional shooter or selected recreational shooters.

[67] Gross margin figures are based on figures taken from the NSW Department of Primary Industry's farm budgets and costs http://www.dpi.nsw.gov.au/agriculture/farm-business/budgets. <accessed 05.11.09>

Potential Funding

- Productive land: generate gross margins of $18/DSE from livestock and upwards of $142/ha from arable land, or lease the productive area to another farming enterprise at market rates.
- Rocky ridge: biofuel companies or carbon trading.
- Remnant vegetation: mitigation bank. Alternatively, the investor's return is from capital gain in land values.
- Riparian: wetland mitigation bank and carbon trading.
- Kangaroos: meat sold to food processors or individuals prepared to pay for recreational shooting.

Table 6: ***Wheat Belt Ecosystem Services.***

Land type	Ecosystem services					
	Food & Fibre	Biodiversity	Water	Biofuels	Carbon	Recreation
Productive	✔				✔	
Arable - rocky				✔	✔	
Remnant		✔				
Riparian/wetlands			✔		✔	
Other - kangaroos	✔					✔
	Funded by					
Productive	Consumer				ETS: soil	
Arable - rocky				Fuel company	ETS: trees	
Remnant		Covenant				
Riparian/wetlands		Mitigation bank			ETS: trees	
Other - kangaroos	Consumer					Hunting

Scenario 3: Pastoral Property (Government Buyback)

Assumptions

Zone: Pastoral.

Area: 80,000ha.

Productive: 95%, livestock (85%) and cropping (10%), water entitlement 12 gigalitres[68] applied to 2,000ha.

Remnant: 4%, high conservation value species, or capable of being regenerated to this condition.

Riparian: 1%, with all tributaries flowing to a major river system.

Other: community concerns that turning the farm into a National Park will result in a significant reduction in contributions to the local economy and inadequate control of feral animals, noxious weeds and fire fuel loads.

Enterprises: sheep, cattle, dryland and irrigated cropping.

Gross Margin[69]: livestock - $15/DSE (dry sheep equivalent).
cropping - $116/ha.
irrigated – $252/ha.

Management Strategy: purchase the property, place a covenant on the remnant vegetation, transfer the irrigation water to the Future Fund, re-sell the property with the covenant on the remnant vegetation.

- Productive land: is returned to farming with food and fibre production from livestock and dryland cropping. This will ensure that the local community continues to benefit from the farm's economic activity and contribution to shire rates which are vital for community infrastructure and maintenance.
- Remnant vegetation: enhance biodiversity and ecological value using judicious time controlled grazing under the terms and conditions of the covenant. Grazing will reduce fire fuel loads and noxious weeds.
- Riparian: reduce erosion, sedimentation and nutrient loads in waterways by establishing buffer strips.
- Feral animals: sell goats into the livestock market, control pigs with a professional or recreational shooter.

[68] Australia's water licenses are measured in megalitres, being the equivalent of 1 million litres. This is equates to 100mm of water over 1 hectare, or an Olympic sized swimming pool that is 50 m x 20m x 1m deep. A gigalitre is equivalent to 1 billion litres or 1,000 megalitres.

[69] Gross margin figures are based on figures taken from the NSW Department of Primary Industry's farm budgets and costs http://www.dpi.nsw.gov.au/agriculture/farm-business/budgets. <accessed 05.11.09>

Potential Funding

- Productive land: gross margins of $15/DSE from livestock and upwards of $116/ha from arable land.
- Remnant vegetation: mitigation bank, or subsequent investor's return is from capital gain in land values.
- Riparian: water utility (similar to the New York Watershed Agricultural Council), carbon trading.
- Feral animals: goats sold to live market or food processors, pigs use paying recreational shooters.

Table 7: ***Pastoral Zone Ecosystem Services.***

Land type	Ecosystem services					
	Food & Fibre	Biodiversity	Water	Biofuels	Carbon	Recreation
Productive	✔				✔	
Water entitlement			✔			
Remnant		✔				
Riparian			✔		✔	
Other - goats & pigs	✔					✔
	Funded by					
Productive	Consumer				ETS: soil	
Water entitlement			Future Fund^			
Remnant		Green fund				
Riparian			Water utility		ETS: trees	
Other - goats & pigs	Consumer					Hunting

^ The Future Fund is the Australian Government's public sector superannuation investment fund.

Recommendations

Australia should establish a *National Stewardship Initiative*, using seed capital from Government, with a clearly defined process and timetable for moving to a self-funded model. The benefit to Government, land managers, taxpayers and the environment is a more cost-effective delivery of landscape scale ecosystem services and preservation. It would also provide national oversight of the collective work that is being undertaken, ensure corporate knowledge is retained and remove many of the underlying factors that contribute to the current piece meal approach.

Establishment of the Initiative should be facilitated through a roundtable and series of workshops with the goal of developing the Initiative's charter and objectives. This would ensure that all stakeholders are engaged at the outset, resulting in a considered consensual stewardship model with the ability to successfully deliver the identified outcomes.

The Initiative's charter should include the establishment of;

1. a National Stewardship Centre that contributes to ecosystem solutions and knowledge through innovative, interdisciplinary approaches to applied research, development, extension, practice and market engagement,
2. a National Stewardship Framework to ensure rigour, integrity and consistency in the development of all ecosystem initiatives, and
3. appropriate sites to undertake R&D and demonstrate the principles of the Initiative by show casing working rural landscapes delivering triple bottom line results.

The Initiative's objectives should be to;

a. engage all stakeholders, especially land managers and the private sector who are currently being lead through the process;
b. develop targeted R&D tax concession programmes to assist the private sector to best allocate R&D funding;
c. design robust MBI's incorporating national Best Management Practice (BMP) standards;
d. consider in detail all funding options, including those proposed in this report;
e. create a communications strategy for end users and land managers to promote the ESS and its benefits;

f. establish an education and training programme to deliver extension services to land managers; and,
g. develop a rigorous monitoring and evaluation programme to underpin the scheme's integrity.

The Australian Government should provide enabling legislation to facilitate the establishment of the *National Stewardship Initiative*. This would enable a lightly regulated non-government organisation to administer the scheme, which would lead to programme continuity, provide greater market confidence and stakeholder engagement, and encourage the private sector/consumers to develop and foster the marketplace.

Australia's stewardship schemes should, where possible, be private sector funded/consumer pays, whole-of-landscape, voluntary, implemented on marginally productive land and paid as a performance-based, annual cashflow stream. This would provide Government with a much greater capacity to cost effectively balance the nation's food security needs with its environmental expectations.

Conclusion

"History will not accept difficulty as an excuse."

John F.Kennedy

Society is faced with an incredibly complex challenge as it attempts to feed a burgeoning population, balance competing land use demands and address the resulting impacts on its inextricably linked ecosystems. Despite this, human ingenuity has repeatedly demonstrated a capacity to resolve seemingly intractable problems, as evidenced by putting a man on the moon, while shared common goals have united otherwise disparate groups[70].

There is significant scope for Australia to strengthen its existing environmental programmes. Establishing the *National Stewardship Initiative* would enable the country to move toward a unified and genuinely sustainable, more comprehensively funded, systems based approach to ecosystem preservation and management.

However, no single MBI will alone deliver sufficient uptake of stewardship initiatives and effect the changes necessary to ensure ecosystem preservation and resilience. A successful national scheme will need to draw on a suite of funding sources and mechanisms to provide a range of environmental goods and services across a highly variable landscape. This will require robust, equitable and flexible national NRM policies, together with a preparedness by Government, land managers and society to challenge and move on from existing paradigms.

In developing a national initiative stakeholders, in particular policy makers, must be mindful that;

1. agriculture is vital to the nation's food security, food sovereignty and sustainable ecosystem preservation.
2. intact ecosystems are essential to humanity; yet, markets have inherent difficulty pricing in externalities, including environmental preservation and enhancement.
3. consumers need to pay the true price for ecosystem goods and services.
4. land managers must be remunerated for stewardship outcomes delivered over and above their duty-of-care.

[70] One of Australia's most enduring community based environmental movements, Landcare, was the result of the National Farmers Federation and the Australian Conservation Foundation uniting to put a proposal to the Federal Government to protect and restore the environment. It now has over 4,000 groups in Australia and has been replicated in Germany, Iceland, Kenya, Tanzania, Zimbabwe, South Africa, the Philippines, Fiji, New Zealand, the United Kingdom and USA http://svc018.wic008tv.server-web.com/, and http://www.landcareinternational.net/ <accessed 05.11.09>

5. a market based ESS should be one of the cornerstones of a national climate change initiative.
6. implementation of the initiative will require strong and committed leadership from Government and the agricultural sector together with open collaboration from all stakeholders, and
7. an effective ESS will require good science, good economics, good policy and goodwill.

Stewardship payments are an essential tool to deliver sustainable, pragmatic and publicly acceptable environmental outcomes. Adopting the proposed Initiative provides an opportunity for ecosystem management to move away from the current piece meal approach, fund activities beyond traditional three-year cycles, and address the issue of ecosystems and their services crossing spatial boundaries. It also presents an opportunity recognise and remunerate farmers who have and will continue to perform a significant role in providing ecological goods and services that benefit the entire Australian community.

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About the Author

Sam Archer was awarded an Australian Nuffield Farming Scholarship in 2008 and travelled throughout the Americas, UK, Europe and India researching private sector funded environmental stewardship schemes broadly based around carbon, water and biodiversity. This research comes at a time when Australia's ongoing drought and pending Emissions Trading Scheme present challenges for farm profitability and sustainability, community resilience, food security and society's environmental expectations.

He runs a mixed farming system with his wife, Sabrina, based on livestock, cereal production and native pastures at Gundagai. Their farm has been a research site for the CSIRO's Sustainable Ecosystems programme and the Australian National University's Centre for Resource and Environmental Studies. In 2002, it was selected as a pilot site for the Australian Government's national environmental stewardship programme.

He is Chair of Murrumbidgee Landcare, representing 2,000 land managers in the Murrumbidgee catchment, a member of the Australian Farm Institute's Research Advisory Committee, the BioBanking Ministerial Reference Group, a Board Director of the NSW Farmers Association and Chair of the Association's Business, Economics and Trade Committee.

During the nineties he worked with aboriginal resource agencies delivering socio-economic programmes to remote communities in Western Australia and, when not farming, has since been engaged as a corporate trouble shooter within the logistics, utilities and environmental sectors.

He graduated Dux from Marcus Oldham Farm Management College (1988) and holds a BCom (1990) and a BArts (1995) degree in Commerce and Anthropology (Hon 1st class) from Deakin University and the Australian National University respectively. His honours thesis explored cultural identity among Mongolian pastoral nomads in the face of Russian dominance throughout the 19th and 20th centuries.

Sam's interests include cycling, photography and the outdoors. This has seen him cycle 1,600 km through the Himalayas, and travel to both the Antarctic and Arctic. He has also taught and trekked extensively in Nepal.

Plain English Compendium Summary

Project Title:	Market Based Ecosystem Services: A proposed *National Stewardship Scheme.*
Nuffield Australia Project No.:	0814
Scholar:	Sam Archer
Organisation:	Environmental Capital/Wallaby Creek Pastoral Co
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Objectives

To promote a model for a sustainable, commercially viable, pragmatic and publicly acceptable national stewardship initiative and engage all stakeholders toward achieving sustainable and resilient outcomes, by improving the understanding of private sector/consumer funded stewardship initiatives

Background

The world's ecosystems face competing demands from agriculture, mining, forestry and urban development. Forecasts indicate the world's population will increase 50% by 2050 and food demand will double in the next 50 years.

These influences will place increasing pressure on the ability of ecosystems to provide vital environmental goods and services, including food and fibre production. A balance, however, is required between food security, climate change initiatives and ecosystem preservation.

The world's farmers have the greatest capacity to protect and enhance the world's ecosystems. They manage 60% of the world's productive landmass and 70% of it's freshwater and have already developed numerous innovative ecosystem service schemes.

Despite Australian Governments, both State and Federal, embarking on a number of pilot environmental stewardship schemes, these nascent programmes and the institutions that support them have repeatedly suffered at the hands of capricious Governments. Consequently, there has been a resultant loss of continuity, market confidence, stakeholder engagement, corporate knowledge and national oversight of the collective work that has been and is being undertaken.

Research

Research was conducted throughout the Americas, Great Britain, Europe and India, using a combination of interviews, field visits and conferences, studying private sector and government funded stewardship initiatives employed in these countries.

Outcomes

Recognition that there is significant scope for Australia to strengthen its existing stewardship programmes by adopting a range of initiatives, which will enable it to move toward a genuinely sustainable, systems based approach to ecosystem preservation and management.

The convening of a National Stewardship roundtable to bring together thought leaders, innovators and change agents from the sciences, environment, government, agriculture, civil society and indigenous organisations to develop a framework and action plan for a *National Stewardship Initiative*, broadly based around ecological goods and services for carbon, water and biodiversity.

The proposed *National Stewardship Initiative* would include;

1. a National Stewardship Centre that contributes to ecosystem solutions and knowledge through innovative, interdisciplinary approaches to applied research, development, extension, practice and market engagement,
2. a National Stewardship Framework to ensure rigour, integrity and consistency in the development of all ecosystem initiatives, and
3. the identification of sites to undertake R&D and demonstrate the Initiative principles.

Implications

The Australian Government does not have the resources to fully fund a national stewardship scheme. It should provide enabling legislation, allow a light-regulated non-government organisation to administer the scheme and the private sector to develop and drive the market place. This would enable ecosystem management to move away from the current piece meal approach, with initiatives funded beyond traditional three-year cycles and address the issue of ecosystems and their services crossing spatial boundaries.

Central to this is a National Ecosystem Services Scheme (ESS) encompassing a private sector funded/consumer pays, whole-of-landscape approach as a cornerstone of a national climate change initiative. It would be voluntary, implemented on marginally productive land, and paid as a performance-based, annual cashflow stream utilising a range of MBI's.

Farmers would be encouraged to identify their least productive land which might be a combination of, but not limited to; riparian zones, acidic or saline soils, remnant vegetation, water logged areas, wind swept ridge lines, highly eroded or degraded sites. They would manage these marginal areas to deliver ecological goods and services, be they carbon, water, biodiversity or soil related.

These environmental "credits" would entitle the farmer to an annual cashflow stream, provided they continued to deliver the environmental benefits to a standard of peer reviewed industry best management practice which were over and above the farmer's environmental duty-of-care.

Publications

N/A