Agricultural Land Retirement and Biodiversity Policy

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The Commonwealth Government's commissioned study of the status of Australia's natural resources, *State of the Environment 1996*, concluded that there were several serious threats to Australia's terrestrial natural resource base (State of the Environment Advisory Council, 1996). Land degradation was found to be widespread, the health of the inland river systems seriously impaired, and many forms of biodiversity were found to be at risk. The threats to Australia's terrestrial biodiversity are evidenced by potential and actual species extinction, and changes to natural vegetation cover. For example, in southern Australia most original grassland communities have disappeared, replaced by cereal crops and introduced grass species planted as pasture for sheep and cattle. The little native grassland that remains is either on privately owned properties or scattered along roadsides and railway lines (Australian Nature Conservation Agency, 1995). The extensive alteration to the composition of native flora and fauna that has occurred due to agriculture and forestry throughout Australia has contributed to the extinction of seventy-six plant taxa, seventeen mammals, three birds and one lizard species. In addition nearly 300 other vertebrate species are listed as seriously endangered (Nadolny, 1998).

In addressing the issue of biodiversity policy there are two important trends that need to be recognised. Firstly, along with other environmental goods, conservation reserves for the protection and display of Australia's biodiversity can be expected to experience increasing demand over time. Although it is difficult to estimate the dollar value to society of expansions in conservation reserves, Australia's increasing population and its rising trend incomes can be expected to underpin substantial growth in the demand for these environmental services into the foreseeable future. Secondly, there is an increasing focus, within the scientific community, on the need to devote more land to the existing network of conservation reserves (Thackway and Cresswell, 1997; ANZECC and ARMCANZ, 1996). It seems that the increase in supply of land for

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biodiversity called for by scientists corresponds with the re-allocation of resources preferred by the Australian population.

Currently, the setting aside of agricultural land for biodiversity objectives is only practised on a small scale in Australia. Implementation occurs regionally and on individual farms through schemes like *Land for Wildlife*, the *Conservation Covenant* program in Victoria and the South Australian *Heritage Agreements* (DEST, 1994; CSIRO, 1997). Other agricultural environmental schemes, such as *Landcare*, make a contribution to protecting biodiversity, but are more concerned with promoting sustainable agriculture. It is here that government has a role to play in setting aside more agricultural land for biodiversity objectives. This is because environmental altruism and community participation will yield a sub-optimal level of land for biodiversity.

The concept of using the large-scale retirement of land from agriculture as a policy tool is not new, and it is an important feature of the agricultural policy mix in the United States and Europe. Although the policy agenda with respect to biodiversity and conservation on agricultural land in Australia is markedly different from that of Europe and the United States, some important points are clear. Take for example the Environmentally Sensitive Areas (ESA) scheme in Europe that encourages landowners to manage their land to yield biodiversity benefits (Whitby, 1994; Baldock and Lowe, 1996; Fraser and Russell, 1997). The important points for Australian policy makers to note about this scheme are that large tracts of agricultural land are covered, financial incentives are offered to participants, and its operation appears politically acceptable to both the agricultural community and the wider electorate.

In this paper issues that appear important in thinking about retiring land from agriculture and adding it to Australia's biodiversity reserves are raised. While the main reference framework is provided by economics, insights from ecology are also utilised and are crucial. We do not address the formidable task of quantifying the benefits of biodiversity provision from moving land from agriculture to biodiversity reserves. Accepting that these benefits — many of which are non-market benefits — are significant, allows us to focus on exploring questions central to the costs of achieving them. However, we discuss some other benefits specific to Australian circumstances that accrue as a result of conservation reserves.

Government Policies for Dealing with Threats to Biodiversity

Australia has a complex mix of State and Commonwealth government policies directed to protecting biodiversity. The Commonwealth's commitment to protecting biodiversity is evidenced by its decision to ratify the International Convention on Biological Diversity in 1993. The main provisions of this convention are reflected in the National Strategy for the Conservation of Australia's Biological Diversity (Munchenberg, 1998).

Historically the main policy instrument used to achieve biodiversity objectives has been the establishment of a system of national and state parks. The idea in developing the reserve system is to conserve and maintain biodiversity *in situ*. Thackway and Cresswell (1997:241) argue that:

The establishment of a comprehensive, adequate, and representative system of protected areas is arguably the most effective mechanism for the conservation and maintenance of ecological functions and services across entire landscapes.

The reserve system that has evolved is predominantly based in non-agricultural regions or on marginal agricultural land. This is because the areas that have been selected are of high scenic or recreation value, or have other special characteristics and are of relatively low commercial value for grazing and farming purposes. Thus the traditional ecosystems of the agricultural regions tend to be markedly under-represented. Young et al. (1996) note that more than half of all major biogeographic regions in Australia are either not represented or are poorly represented in the reserve system. In particular in the Wheat Sheep Zone and the rangelands very little is set aside for conservation (ANZECC and ARMCANZ, 1996).

In recent years the reserve system has been supplemented with programs to protect particular individual species that are under threat and with encouragement to farmers to incorporate broad environmental objectives in their management plans. There is an emphasis in these initiatives on modifying agricultural practices. This may be because most, and in some bioregions all, land containing ecosystems that are under-represented in the public reserve system is privately managed. However, it needs to be reiterated, policies such as *Landcare* are concerned with agricultural sustainability, which can be significantly different from ecological sustainability and the maintenance of biodiversity.

Where farming land has been set aside to preserve plant species, it is usually small areas of low productivity. The consequence is to perpetuate the pattern of preserving vegetation types found in soil classes and locations that are least favoured for agricultural production. Remnant native vegetation tends to be highly fragmented and concentrated on the land that is least suited to agricultural production. Similarly, land that is offered by farmers for re-vegetation also tends to be of relatively low agricultural value.

While smaller scale conservation areas may be useful in dealing with risks to some native flora and smaller wildlife, they are largely ineffective in dealing with threats to larger fauna species.¹ Large areas are necessary to establish

¹ As analysed by Polasky and Doremus (1998), private individuals may have incentives to extinguish flora and fauna of environmental value.

viable habitats for some bird species and larger mammals. Wildlife such as kangaroos, wallabies, wombats, dingoes and emus will not be tolerated in meaningful numbers (or at all in the case of dingoes) in smaller scale set-asides on individual farms because they have the potential to become a major nuisance for neighbouring farmers. These species represent an important part of many natural ecosystems in Australia.

There has been little evaluation of the feasibility of expanding the reserve system. Larger scale land retirement has not been seen as a viable biodiversity policy in Australia because it is perceived to be both prohibitively expensive and excessively invasive when compared with voluntary community-based schemes such as *Landcare*. The experience with land retirement in other countries confirms that it can be expensive, but social net benefits can vary markedly between cases depending on the circumstances involved.

Additions to biodiversity reserves could occur through private or government initiatives (Chisholm and Moran, 1993; Bennett, Backhouse and Clark, 1995). In practice, because of the large component of non-market benefits, it will be necessary for government to play a key role in establishing and supporting such reserves, even when managed by private firms.

The Cost of Retiring Land for Biodiversity

In assessing the overall economic effect of land retirement, it is important to distinguish clearly between the real benefits and costs of the project on the one hand and, on the other, the transfer payments involved in financing it. The size of the financial transfers from government or other organisations to landowners to implement the project may influence its political feasibility, but it is the balance between real benefits and costs that determines whether the project is worthwhile from a national perspective. The existence of a positive community valuation of biodiversity reserves is taken for granted here. It is the costs of setting agricultural land aside, and some of the less obvious benefits of doing this that are explored. The economic costs of using land retirement can be divided into opportunity costs of lost rural production, and the costs of establishing and maintaining the resulting conservation reserves.

Loss of production and the rise in wool and dairy prices

The private opportunity cost of retiring land is represented by the net present value of the future stream of profits that would come from the agricultural enterprises carried out on the land. In the case of large areas of the Pastoral Zone (such as the Western Division of NSW) the principal enterprise is wool production, while in the Wheat Sheep Zone the enterprises are wool, sheep meats, cattle and crops. The wool industry has been in a parlous state since the collapse of the Wool Reserve Price Scheme in 1993. Real wool prices fell to

all-time low levels in 1996 and have only recovered marginally since. The examination of long term farm profitability has led to questioning of the continuing economic viability of pastoral production (including wool) in the semi-arid regions of Australia (Chisholm, 1992).

Where farm income is dependent on wool production, there is likely to be a marked difference between the opportunity cost of lost production confronted by an individual wool producer and that facing both the wool industry in total and Australia as a whole. Any contraction in the supply of wool from Australia will tend to increase the world wool price and the price received by Australian wool producers. Given this market power, a policy of restricting wool exports using a tax or quota would be expected to increase social welfare (Edwards, 1997). In the absence of an appropriate restriction of wool exports, removing land from wool production would allow some of the benefits of reduced wool production to be obtained, perhaps making the true opportunity costs of lost wool production to Australia as a whole negative. That is, the remaining wool producers and Australia as a whole could gain from retiring wool-producing land from production. The size of the gain would depend on how much land was retired and on the level of wool production lost from that land, the responsiveness of wool prices to falls in production, and how much the remaining wool producers would expand production in response to the subsequent increase in wool returns.

Estimates of the potential order of magnitude of the gains that would be possible from a one per cent reduction in wool production are reported in the Table. Depending on how responsive the world wool market is to changes in wool prices (measured by the price elasticity of demand), the overall gain in wool industry profits from a one per cent fall in wool production would be between \$16m and \$48m a year. These gains would accrue to those producers remaining in the wool industry and do not include the lost profits on the land taken out of production.

Wool Industry Gains from Land Retirement

Price Elasticity of Demand for Raw Wool	Change in Wool Prices from a 1 per cent Reduction in Wool Production (% pa)	Change in Wool Industry Profits on Remaining Production (\$m pa)
-0.5	2	48
-1.0	1	24
-1.5	0.67	16

Note: Assumes a market price of 555 cents a kg clean and an annual production level of 435.5 kt clean.

There is reason for thinking Australia's dairy production also exceeds the economically-optimal level, and that retirement of land from this industry would

also generate economic gains. The reason lies in two distorting policies used in the dairy industry, rather than — as with wool — a strong Australian influence on international prices.

The first of the policies is the modest subsidy on exports of manufactured dairy products. This subsidy is being phased down and is scheduled to terminate in 2000. The second is the policy in three states of paying farmers a pooled price for 'high price' market milk and 'low price' manufacturing milk. The pooling system operates in Victoria, Tasmania and South Australia, which together produce three-quarters of Australia's milk. Retiring some dairying land in those states would reduce milk production. The national value at export prices of the milk foregone would be less than the reduction in quantity times the pool price. The pooled price received by dairy farmers remaining in the industry would increase.

Establishment and maintenance costs

One significant cost would be in re-establishing native flora and fauna. In many agricultural regions native vegetation and fauna stocks have been hugely reduced due to agricultural and forestry activities. The re-establishment of eco-systems adequately representing the natural biodiversity of these regions would likely not be achievable within reasonable time frames without considerable remedial action. These activities would include planting of native vegetation and the relocation of animals to the region to re-establish breeding populations.

The maintenance costs associated with an expansion in the reserve system will depend on how prone the areas are to infestation by weeds and pests. In most grazing regions, weed and pest invasion are significant problems. Weeds such as Patterson's Curse and St Johns Wort are widespread and have the potential to invade larger areas, radically changing the vegetation mix. In the absence of effective biological control measures, weed management is a critical issue. The major pest species in grazing areas is the rabbit. The cost and importance of rabbit control will depend on the effectiveness of the Calcei Virus, and it is still too early to make judgements on this.

Additional benefits: cost offsets

The magnitude of the economic gain to society from retiring land from farm production also depends on the nature of the retirement scheme and the options for commercial use that are retained. The retirement of land into a national reserve system could be consistent with the commercial use of the land for the controlled harvesting of native flora and fauna, recreational use and limited private dwellings. The Industry Commission (1997:148) has even suggested:

Pastoralists who are able to diversify into other activities may be able to maintain or even increase income while at the same time reducing the pressure on the fragile environment which prevails in the rangelands.

Take the case of commercial harvesting of native fauna. The removal of commercial agriculture from the retired land would lead to a recovery in kangaroo numbers. The uncontrolled expansion in kangaroo numbers is undesirable because it could threaten the re-establishment of the native vegetation and consequently the re-colonisation by other native fauna. The expansion in kangaroo numbers could be limited by removing water points, or by introducing natural predators such as dingoes. These control options involve costs, but commercial harvesting provides the potential for additional returns to the community over and above the biodiversity gains from the extension of the reserve system. While the commercial utilisation of natural resources, flora or fauna as an alternative means of generating income is supported by the Industry Commission (1997), existing Commonwealth legislation restricts the trade in native flora and fauna.

The prospects for commercial use to reduce the net opportunity cost of establishing a wider reserve system will depend critically on the potential profitability of the alternative commercial uses which in turn depend in large part on consumer preferences here and in other countries. Although there has been a long history of commercial harvesting of native flora and fauna in Australia, there is no experience with incorporating such activities with the continuing maintenance of a large reserve system. At an institutional level, changes to the Australian and other countries' restrictions on exports of native animals and animal products could be important factors in determining the potential for commercialisation.

Similarly, while the recreational use of reserve areas is widespread, these activities are not run as commercial ventures. Access and use prices are set to contribute to cost recovery rather than to generate profits. The viability of commercial ventures will depend on the features and characteristics of each area. Ease of access, scenic qualities and potential sustainable harvest rates will be key parameters in these calculations.

An additional offset item resulting from an expanded conservation reserve system is a reduction in the continuing costs of other community activities and enterprises. This benefit would flow from reductions in farming-related depletion of the quality of river systems and, through redressing imbalances in water recharge areas, from reductions in the incidence of dryland salinity.²

² A reviewer has noted that, if farmers were required to pay for the environmental costs they generate, the retirement of marginal land from farming would be more attractive.

Finally, a particularly topical social benefit of a more ecologically sustainable management of the rangelands comes from their use as a carbon sink. The Industry Commission (1997:138) noted these possibilities as follows:

... there is scope for synergies between expanding vegetation, particularly native vegetation, for land management, biodiversity protection, and the sequestration of carbon.

The scope would be greater in the event that a system of internationally tradeable quotas for greenhouse emissions is introduced. This would be consistent with the provision in the Kyoto Protocol of December 1997 for emission trading between countries (ABARE, 1998). The potential for Australia to gain by converting agricultural land to biodiversity reserves cum carbon sinks, would be enhanced most by international trade in emissions if the opportunity cost of land diversion was low relative to other countries.

Regional impacts

The support of local communities for the retirement of land from agricultural production will depend on its impact on local regional economies and communities. Land retirement has the potential to reduce population densities in targeted regions, placing in question the sustainability of local towns and the viability of commercial and community service networks. However, these impacts are not certain. The impact on the population of targeted areas and the local economies will depend on how labour-intensive reserve management becomes, how the regions benefit from the consequent higher wool and dairy prices, and the extent to which alternative commercial operations flow from the reserves. The overall impact of these factors on regional communities is a potentially important policy implementation issue that needs to be assessed on a case by case basis. In the event that the local effect were negative but the national balance of benefits and costs was positive, the appropriate response would be to consider providing the local community with assistance in other ways, rather than rejecting the land retirement proposal.

Co-existence of user rights

Substantial areas of the rangelands are subject to native title claims and contain ecosystems that are under-represented in the national reserve system. It is possible that, where conflict exists between pastoralists on leasehold land and traditional landowners, an additional benefit might emerge from land retirement. It is suggested that if land that is subject to dispute is retired from traditional commercial agriculture uses, resolution of the land use conflict might be easier to achieve. This is because the management of land as a biodiversity reserve is

likely to be more compatible with the rights of native title-holders than is commercial agriculture.

This coexistence could be facilitated by the establishment of alternative commercial ventures based on the exploitation of native flora and fauna reserves. While the diversification of land use has the broad support of traditional land owners (Industry Commission, 1997:148), the existing leasehold conditions in some rangelands areas limit the ability of lease-holders to move out of grazing activities into these alternative ventures. The current limitation of existing lease arrangements on the ability of graziers to diversify has been noted by the Industry Commission (1997:149) which suggests that:

It is clear that changes to leasehold conditions are necessary if pastoralists are to be given the necessary degree of security of property rights to be able to diversify into alternative commercial activity.

It should be noted that the granting of additional or new rights necessary to enable the graziers/pastoralists to alter their form of production might be inconsistent with the rights of native title-holders. However, the more complementary are the competing land uses, the more likely it is that a cooperative solution could be achieved.

Policy Implementation

Funding

The major difficulty with using land retirement as a policy tool to conserve biodiversity is in acquiring production rights from land managers. Regardless of whether production rights are acquired compulsorily or voluntarily, a price will have to be placed on them. This raises questions about the price that should be paid and how the required funds are to be raised.

If the scheme involves acquisition of entire holdings or leases, the current market price for land would be an appropriate basis for valuation. However, rural land is a highly heterogeneous factor and the determination of market values is difficult. Experience in other countries suggests negotiations over compensation for rural landholders entering into voluntary land retirement schemes are characterised by asymmetric information (Fraser, 1995). Because farmers are generally far more aware of the characteristics and value of their holdings than program administrators are, they have an advantage in negotiated settlements. One approach would be to follow urban planning legislation and use compulsory purchase. However, this may not be politically feasible. In the rural setting it may be politically necessary to employ voluntary approaches, requiring the use of appropriate incentives — the payment of compensation — to bring about the desired result.

Appealing to the Beneficiary Pays Principle (BPP), (Fraser and Russell, 1997) it appears reasonable to suggest that the substantial funds required to remove land from conventional agricultural production be raised from those who stand to benefit from the operation of the reserve scheme, with contributions made in proportion to the relative benefits derived.

These beneficiaries can be classified into two groups: those who benefit from enhanced biodiversity *per se* and those who benefit from the consequent rise in prices of wool and milk and from the improvement in water quality. The first group presumably includes the wider Australian community, while the second is made up of wool and dairy producers and the communities that benefit from improved catchment management in the target areas. Higher income tax payments by woolgrowers mean that the community would share in the benefits from a higher wool price.

There would be considerable political and other difficulties in raising funds for a land retirement program from wool producers, dairy farmers and local communities. Many woolgrowers are experiencing low incomes, and the benefits they would receive from extending biodiversity reserves are indirect and largely invisible to the individual producer. However, there is a precedent for using a tax on wool producers to fund measures to reduce wool production. That is the grower-funded flock reduction scheme used in 1990-91 in an effort to sustain the reserve price scheme. Taxing dairy farmers only in the three states that use price pooling for market and manufacturing milk would likely violate the Constitution. Effective revenue raising from those who gain from the broader social benefits of setting aside agricultural land would also prove difficult.

The political feasibility of funding land retirement from consolidated revenue has been enhanced by the increasing sensitivity of the general community to environmental issues. However, funding from consolidated revenue creates an efficiency loss due to the increased tax burden. Campbell and Bond (1997) estimate that raising an extra dollar of income tax revenue involves not only the transfer of a dollar from taxpayers, but a deadweight economic loss in the range 19 to 24 cents. This deadweight cost of taxation is not incurred in taxing wool producers as the tax tends to reduce production toward its most efficient level.

Funding land retirement from existing purpose-specific environmental funds is perhaps the most politically attractive option. It could come from specific-purpose funds such as the National Heritage Trust, or the general environmental budget. The use of these sources highlights the importance of prioritising environmental projects.

Finally, it is worth noting that, to the extent to which land retirement increases the taxable income of the rural sector, funding land retirement from general tax revenue is at least partially self financing.

Selection of land

The selection of land for retirement should take into account the environmental value of the land and the cost of the acquisition and management. The environmental value reflects the characteristics of the individual holding plus its potential contribution to a wider reserve system. A scheme that allowed all landowners in a region to participate in a tender to supply land for adding to conservation reserves could provide the basis of the acquisition process.

In assessing the environmental value of a proposal a critical question is the size of the parcels of land that should be retired. In other words, should the aim be to retire ten per cent of the land on each farm in a region or should the ten per cent of the region removed from agriculture be concentrated in a small number of parcels?³ The optimum size of individual land parcels accepted into a scheme will depend in large part on the nature of the environmental objectives that underpin the scheme. There are persuasive reasons for opting for larger parcels of land concentrated in strategic areas rather than smaller areas scattered throughout a region.

While the management of weeds and pests is difficult in larger parcels, the ecosystems in larger reserves will suffer less pressure from neighbouring agricultural enterprises. Also it will be cheaper to fence and secure larger parcels than smaller parcels and supervision and monitoring may be easier. Moreover, larger reserves may have greater potential for tourism and recreation and could offer better prospects for the commercialisation of native flora and fauna harvesting. Finally, the preservation of some species, most notably larger mammals, is not feasible in small isolated parcels surrounded by agricultural enterprises.

If the land is highly heterogeneous in environmental value, an open call for tenders could involve substantial assessment costs on the part of program administrators. An alternative approach would be to establish a limited offer-to-bid scheme. Experts in the analysis of biodiversity and ecosystem management would identify a range of suitable properties on the basis of their potential biodiversity values in a reserve system. The land managers of the targeted properties would then be invited to enter tender prices, individually or collectively, for the supply of the properties or the production rights attached to the properties. There is a wealth of experience to draw upon from other countries in relation to the use of this type of mechanism in conservation management (Babcock et al., 1996, 1997; Fraser, 1996).

³ The World Conservation Union (IUCN) has suggested that 10 per cent of land in each bioregion should be set aside in conservation reserves (SEAC, 1996).

Conclusion

Larger-scale land retirement schemes merit close consideration in Australia. The demand for conservation reserves to reduce threats to Australia's terrestrial biodiversity is growing, and is likely to continue to do so into the future as incomes and population levels trend upwards. Moreover, the ability of the current policy mix to satisfy this increase in demand is highly questionable, indicating a need to consider new policy alternatives including the large-scale retirement of land from agricultural production. The scientific literature points to strong reasons for thinking that, in terms of reducing risks to biodiversity, the approach of establishing conservation reserves through the retirement of land from agricultural production would often be superior to the present approach of modifying farmers' production technology.

The key suggestion in this paper is that the expected real national cost of extending the conservation reserve system is unlikely to be high. This is because for land currently used in wool production, the circumstances exist for a genuine double dividend to be received from land retirement. The wider community would benefit from the reduced threats to biodiversity while the wool industry and the community would benefit from higher wool prices. In the case of the dairy industry, policy-induced price distortions increase the economic gains from land retirement.

There are other potential benefits from setting aside agricultural resources. These include: controlled sales of native fauna and flora; recreation; reductions in the degradation of land and water; reductions in net emissions of greenhouse gases; and facilitating resolution of conflict between pastoralists and traditional landowners. These potential benefits, which are additional to the benefits from extra biodiversity reserves *per se*, could be significant offsets to the real costs of establishing and maintaining such reserves.

While the expansion of Australia's conservation reserve system through the retirement of land from agriculture has much potential, there are issues which need to be refined before the concept of land retirement becomes a viable option to put before the policy stakeholders and the electorate. In all likelihood, valuable insights into at least some of these issues will be gained from a closer examination of the operation of land retirement schemes in the US and Europe.

However, there are important differences between Australia and these other regions of the world in terms of environmental agendas and political settings that need to be considered when evaluating policy initiatives in this area. For example, an important feature of policies like the ESA scheme in Europe is that strong complementarity exists between agriculture as a land use and the provision of biodiversity and conservation. This is because the environment that is demanded is semi-natural, meaning that agricultural and environmental outputs can be produced simultaneously. In Australia biodiversity provision is

expected to be best achieved by land in a state of wilderness — there is no place for agricultural activity.

Chief among the issues that will need to be clarified before land retirement can become a viable biodiversity policy option in Australia is the mechanism for raising the considerable financial resources likely to be needed to implement the scheme on a meaningful scale. While the outlays for acquiring farming land in themselves have no place in a national cost-benefit analysis of land retirement, in the final analysis the politics of taxation and public expenditure priorities will be a critical element in determining the viability of this option.

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