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Introduction: Framing the agri-environment

Dean Ansell, Fiona Gibson, and David Salt

Conservation in an agricultural space

Do our agricultural landscapes hold the key to protecting our declining biodiversity? If they do, how would it be done? And who would pay? Would it be the landowner, or the general public (via the government)? These might sound like simple questions, but when you consider some of the environmental, social, and economic factors at play, it quickly becomes apparent that we are dealing with very complex issues.

To illustrate this, consider these two relatively simple situations, both examples of efforts to conserve biodiversity on farmland in Australia. The first involves a run-down paddock from which the landowner has removed his sheep and sown a mixture of native trees and shrubs in strips several metres apart. In exchange for a stewardship payment of \$50 per hectare per year, the farmer agrees to keep his sheep out of the paddock for five years. He gets half the payment at the beginning and the rest at the end of the initial five-year period, at which time grazing stock are permitted back into the paddock under a regime where sheep are allowed into the site in short bursts (called 'pulse grazing') for the last five years of the agreement. By this time, the

native vegetation should have developed enough to be able to cope with the reintroduction of grazing. Indeed, the presence of trees and shrubs will provide the grazing animals with valuable shelter.

Figure 1.1: Do our agricultural landscapes hold the key to protecting our declining biodiversity?

Source: Photo by Greening Australia.

The second situation involves a farmer agreeing to remove grazing sheep from a patch of box gum grassy woodland — an ecosystem now threatened in Australia. The farmer is allowed to let sheep into the woodland for pulse grazing, whereas previously the woodland experienced set stocking, meaning a certain number of animals were always there. The landowner also agreed not to use fertiliser in the woodland. For these actions, the government is prepared to pay the farmer over \$200 per hectare per year, and the farmer has entered into a contract that will run for 15 years.

The first situation describes a process of restoration, with the aim of returning native vegetation to the landscape. It is about improving the natural value of degraded land, providing habitat for biodiversity and other environmental benefits. The second example is more about the preservation or conservation of an existing ecosystem. It is about

sustaining the health and resilience of land with high natural values. Both schemes are undertaken in production landscapes, and the land under each scheme is expected to continue to provide agricultural outputs into the future.

Even with these simple descriptions, many questions immediately arise:

- Which approach is better for biodiversity, restoration, and/or conservation?
- Where do we get the best value for money? One farmer is paid four times the amount the other farmer receives; do we receive four times the return?
- Why should the government pay for a scheme which benefits the farmer (in the case of new trees providing shelter for stock)?
- Why does one scheme only run for 10 years when the other goes for 15?

Of course, there are many answers to each of these questions given by different groups. ‘Which approach is better?’, for example, would most likely be responded to differently by ecologists, economists, farmers, policymakers, and the public — and there would be considerable variation within each group. This variation simply underscores the complexity and uncertainty surrounding the operation of these schemes.

The two case studies described here are far from hypothetical exercises. They are based on real-life examples of publicly funded programs currently in operation on farmland in south eastern Australia. The first example (restoration) is called the Whole of Paddock Rehabilitation scheme (WOPR) being operated by Greening Australia (an environmental non-government organisation (eNGO)). The second case study (conservation) is part of an Australian Government program called the Environmental Stewardship Program. Both are described in more detail in this book (see Chapter 2 by Graham Field for background on WOPR, and Chapter 3 by Emma Burns and colleagues on the Environmental Stewardship Program).

Figure 1.2: Agri-environment researchers and practitioners in a five-year-old WOPR site.

Source: Photo by David Salt.

In addition to having differing aims, payments, and duration, the schemes are also quite different in how they were developed and managed. WOPR came out of a grass-roots engagement between farmers and Greening Australia. The Environmental Stewardship Program was developed as a top-down government program to protect natural values that are considered to have national significance — in this case, the conservation of a threatened ecosystem. WOPR involved many ‘back paddock’ experiments, custom-made equipment, discussion, reflection, and trial and error (Streatfield et al. 2010). The Environmental Stewardship Program involved ecological, economic, and social science inputs, the development of legal contracts and the setting aside of funds beyond the traditional three- to four-year budget cycle.

WOPR and the Environmental Stewardship Program are but two examples of what are commonly referred to as ‘agri-environment schemes’. There are many other variations of such schemes in Australia and around the world. Some, like WOPR, aim at restoring lost natural values. Others, like the Environmental Stewardship Program, aim to modify existing practice to conserve natural values.

We are not holding up these two schemes as examples of good or bad schemes. Rather, the differences between them offer a valuable reference point to discuss the strengths and weaknesses of society's effort to achieve environmental outcomes, generally regarded as public goods and services, from working agricultural landscapes, generally operated in the private realm. The particular environmental outcome this book focuses on is the conservation of biodiversity.

Before we begin to explore the many issues surrounding the design and implementation of effective agri-environment schemes, it is worth reflecting on the relationship between agriculture and biodiversity.

Why our farms are part of the solution

What is the connection between biodiversity conservation and our agricultural landscapes? Doesn't government look after biodiversity on behalf of the public through the creation and operation of national parks and nature reserves? Biodiversity conservation is an important goal of the management of most national parks, but the sad truth is that the world's system of nature reserves is not protecting biodiversity. A mere 15 per cent of threatened species on land are adequately covered by the existing network of reserves (Venter et al. 2014). In Australia, 80 per cent of threatened species are inadequately protected by the reserve system, with 12 per cent receiving no protection at all (Watson et al. 2010).

This is important because the world is witnessing a crisis of declining biodiversity. Species are being lost at 100–1,000 times what is believed to be the natural background rate of extinction, which scientists believe may have profound consequences for the future of human civilisation (Rockström et al. 2009). Governments around the world have signed up to the Convention on Biological Diversity, pledging that they will take actions that will slow and hopefully reverse these declines (Watson et al. 2014). To date, despite this commitment, little has been achieved. The fourth Global Biodiversity Outlook released by the United Nations in 2014 revealed that the rate of species loss is increasing and that the five principal drivers of extinction — habitat change, overexploitation, pollution, invasive species, and climate change — are getting worse (Secretariat of the Convention on Biological Diversity 2014).

Figure 1.3: An Environmental Stewardship Program site — a box gum grassy woodland in which grazing has been modified to protect the woodland’s natural values.

Source: Photo by David Salt.

So what is the connection with farming? There are several broad areas to consider. The first relates to the point made above: our public reserve system is simply not providing adequate protection to our threatened biodiversity, as most threatened species and ecosystems lie outside of reserves, much of it on and around agricultural land. At least 40 per cent of global land surface is used for agriculture (Foley et al. 2005). In Australia, agriculture accounts for more than half of the land surface, with the majority of that land (86 per cent) used for grazing (Australian Bureau of Statistics 2014). If we want to conserve our biodiversity, we need to focus our efforts on agricultural land.

The second area relates to the impact of agriculture on biodiversity. About 70 per cent of the projected global loss of terrestrial biodiversity is attributed to agricultural drivers (Secretariat of the Convention on Biological Diversity 2014). The conversion of land to agriculture results in the loss and degradation of habitats. This directly impacts on plant and animal populations and communities, and alters ecological and hydrologic processes that underpin key ecosystem functions (Millennium Ecosystem Assessment 2005). Australia’s settlement by Europeans over two centuries ago was followed by rapid and extensive

landscape modification, as the settlers sought to tame the bush and establish grazing and cropping land. The initial focus was on clearing temperate grasslands and grassy woodlands (Kirkpatrick 1999). Records suggest that approximately half of the woody vegetation in Australia has been cleared since European settlement (Barson et al. 2000).

In addition to habitat loss, farming practices such as tillage, burning, livestock introduction, and nutrient and chemical usage have had significant negative impacts on biodiversity as well as soil, water, and air quality (Stoate et al. 2001). The early to mid-1900s saw a shift from smaller, low-input, mixed-enterprise farms to more intensive, specialised systems focusing on increased yields from fewer commodities, bringing with it increased fertiliser and pesticide use, and further loss of natural and man-made habitat (Bignal and McCracken 2000; Young et al. 2007). It is undeniable: agriculture has contributed greatly to the global decline in biodiversity.

The third area concerns the importance of biodiversity to the sustainability of our agricultural enterprises. Some elements of biodiversity underpin the quality and quantity of our agricultural output, through the provision of ‘ecosystem services’ — the wide range of benefits that we receive from ecosystems, ranging from food and water to recreation and cultural use. For example, bee pollination contributes more than €1 billion every year to Europe’s strawberry producers (Klatt et al. 2014). Biodiversity can also provide benefits in the control of agricultural insect pests, improved soil fertility, and agricultural productivity (Altieri 1999). (The perceived importance of ecosystem goods and services to farmers is discussed by Saul Cunningham in Chapter 8.)

Lastly, as well as improving the financial outcome from farming, biodiversity benefits farmers by improving the amenity value of some properties and satisfying some farmers’ goals of stewardship. (See Chapter 14 by Maksym Polyakov and David Pannell on the private benefits of biodiversity, and Chapter 12 by Saan Ecker and Chapter 13 by Romy Greiner on non-financial drivers of biodiversity conservation.) Biodiversity is also known to influence peoples’ health and well-being (Keniger et al. 2013).

The bottom line is that agriculture requires the support of a raft of ecosystem services. The problem is that some of these services are valued more highly than others by agricultural producers,

whose values may not align with those of the broader public. Juggling these contrasting values is one of the major challenges of farmland environmental management, and is a key theme throughout this book.

Solutions in the agri-environment

To anyone with an interest in conservation and agriculture, these ideas are hardly revolutionary. The question is, what can we do to conserve biodiversity in productive landscapes? There are many answers here, ranging from individual farmers volunteering their time and effort to re-establish native plants and animals on their farms, through to governments proclaiming laws regulating what farmers can and cannot do. As a spectrum of activity, these approaches might represent end points, going from volunteer effort through to regulation.

Most landowners have a limited capacity to sacrifice the productive capacity of their land (or their time) for non-income earning activities, and volunteer efforts have real limitations on what can be achieved (Curtis 2000). Indeed, the early investment in agri-environmental policy in the 1980s and 1990s focused on stimulating volunteer effort through programs such as Landcare. While popular, this effort failed to address the growing problems of land and water degradation and declining biodiversity (see Chapter 7 by David Salt).

Regulatory approaches, on the other hand, usually entail high transaction costs — especially, for example, in terms of compliance and enforcement — and are widely considered less efficient and cost-effective than alternative strategies (Hahn and Stavins 1992). They are also often unpopular in the agricultural sector. Indeed, the prevailing belief in most western democracies is that farmers have the implicit right to carry out the most profit-maximising activity on their land, irrespective of the external costs (and benefits) of doing so (Hanley et al. 1999). Regulation is usually only introduced where the activity is seen as being clearly unacceptable by the broader population, such as controlling the use of dangerous chemicals or the unacceptable treatment of livestock.

Between volunteering and regulation, however, there are many options employed and implemented by governments and conservation groups around the world, chief among which is the agri-environment scheme. Agri-environment schemes, though highly variable in their structure

and application, can be broadly defined as programs involving payments to farmers in exchange for the provision of environmental goods and services (Burrell 2012; European Commission 2014). Most involve an acknowledgement that the farmer is sacrificing some aspect of their productive potential by providing environmental goods and services for the public good. The two case studies discussed at the beginning of this introductory chapter are examples of agri-environment schemes.

Over time, agri-environment schemes have attracted a growing share of government investment in agriculture across Organisation for Economic Co-operation and Development (OECD) countries, and now represent a significant component of biodiversity conservation in agricultural landscapes, with billions of dollars spent on such schemes around the world each year (Hajkowicz 2009).

Along with Europe and the United States, Australia has been working in the agri-environmental space for some 30 years. Australia's investment in this area has been tiny compared to Europe or the United States, partly reflecting our smaller population and economy, although the size of our agricultural landscape is comparable (Hajkowicz 2009). Given the enormous scale of the environmental challenges being faced in Australia, it is important that our investments in the agri-environment area are cost-effective.

Learning from agri-environment schemes in Australia: About this book

This book is targeted primarily at anyone working in agri-environmental policy or looking at establishing an agri-environment scheme in Australia, including policymakers, project officers, and non-government organisations. It has a secondary aim of producing a short and readable text for anyone interested in the topic of biodiversity conservation on agricultural land.

Chapters are short, engaging, and seek to educate rather than exhaustively prove finer points of analysis. Where possible, we have kept the use of jargon and acronyms to a minimum. Each chapter is a stand-alone story, and we have organised the book into the following three themed sections.

Part I — The agri-environment in the real world sets the scene by describing the challenges and tensions that go hand in hand with running agri-environment schemes. The chapters in this section present a variety of discussions of the complexities surrounding how agri-environment schemes function in real life, and discuss the case studies of the WOPR scheme and the Environmental Stewardship Program, which were presented at the beginning of this chapter. Part I also provides some contextual history of agri-environment schemes in Australia and Europe, and discusses dealing with different types of farmers and the importance of non-government organisations.

Part II — The birds and the beef explores the many natural, social, and economic values involved in agri-environment schemes, and the ways these are framed or marketed. In this section, we discuss the concept of ecosystem services, consider the debate over different conservation strategies, and are presented with an economics perspective on restoration. We also explore the issue of scale in designing agri-environment schemes, the importance of accounting for private benefits in project selection, and the social and psychological dimensions of agri-environment schemes.

Part III — Planning, doing and learning examines many of the issues surrounding the design, implementation, and evaluation of agri-environment schemes. It examines the many challenges of ranking different projects, given that most schemes are oversubscribed — there is never enough money to go around, so how do you get the best outcomes? We discuss approaches to measuring and maximising the conservation benefits, the importance of counterfactual thinking, and the choice of different policy tools. We conclude with the reflections of David Pannell, one of Australia's most experienced agricultural economists, on the performance of agri-environmental policies. He provides a checklist of factors that experience has shown are important to the success of any agri-environment scheme. For anyone with an interest or responsibility in agri-environment policy, this is one list you cannot afford to ignore.

So, what does it all this add up to? We attempt to make sense of the many perspectives in this book in the concluding chapter. We begin our conclusion with a simple hypothetical: if circumstances were to suddenly create a funding opportunity for a new agri-environment scheme, how should the nation respond? This is not idle speculation,

because in many ways the Decade of Landcare was not an opportunity that was widely anticipated. It arose from a historic agreement between the National Farmers Federation and the Australian Conservation Foundation in 1989, coupled with a receptive prime minister. And while that scheme was enthusiastically embraced, it did not generate the enduring environmental outcomes that many hoped for.

A quarter of a century later, and the threat of environmental decline is as great, if not greater, with a rising expectation that our agricultural landscapes will dramatically increase their productive output in order to feed a growing population (see Box 1.1). Furthermore, biodiversity decline is just one of several issues facing society that must compete for limited funds.

Box 1.1: Farming, biodiversity and the future

The world's population is changing rapidly. In the next three decades there will be up to 10 billion people on the planet; Australia's population alone is expected to double by 2075 (Australian Bureau of Statistics 2013). Not only can we expect a lot more mouths to feed, but improvements to the socio-economic status of people across many regions, including Asia and Africa, will lead to changes in diet. This will result in a large increase in food demand, which will in turn require increased food production through the expansion and intensification of agriculture (Phalan, Green, and Balmford 2014). We will need to produce more with less.

The Australian Government's agricultural policy is heavily focused on capitalising on this growth by increasing productivity. The National Food Plan seeks to increase agricultural productivity by 30 per cent by 2025, aiming to increase the value of agricultural exports by 45 per cent (DAFF 2013). The Agricultural Competitiveness Green Paper sets out a plan to increase farm-gate profits by reducing costs and 'unnecessary barriers to productivity and profitability' (Commonwealth of Australia 2014). At the same time, this policy is aiming to 'streamline' the environmental approvals established through key legislation such as the *Environmental Protection and Biodiversity Conservation Act 1999*.

These major changes to agriculture present a significant threat to our biodiversity. Agricultural intensification carries greater biodiversity impacts than extensive farming practices (Reidsma et al. 2006). The amount of remnant vegetation expected to be cleared globally for agricultural use in the next 35 years is in the order of 0.2–1 billion hectares (Tilman et al. 2011). Facilitating the conservation of biodiversity in agricultural landscapes in the face of growing agricultural production represents a key conservation challenge at a global scale (Green et al. 2005). Policies that use incentives to balance conservation and agricultural production will play an increasingly vital role in safeguarding biodiversity in agricultural landscapes.

Should another major opportunity present itself — the announcement of a substantial government investment in agri-environment schemes, for example — will we be able to say we are ready? We should be, after 25 years of experience and research in these programs. Many of the perspectives in this book question our efforts in agri-environment investment and ask exactly what we have learnt. In many places it is suggested we can do a lot better than we currently do with the available resources, in areas including planning, prioritisation, monitoring, evaluation, and learning. In that light, it is our hope that this book will prove an invaluable resource and reference.

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