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Book reviews

Determining the Economic Value of Water: Concepts and Methods, by Robert A. Young. Published by Resources for the Future Press, Washington DC, USA, 2005, pp. xv + 356, ISBN 1 891853 98 8 (pbk), \$US 39.00.

Economics of water use and management is emerging as a key requirement for driving water policy change in Australia and worldwide. This makes *Determining the Economic Value of Water* a very topical and useful read.

The book is presented in a neoclassical economics setting, in contrast to a recent trend of institutional and neo-institutional approaches to water economics. Rather than elaborating on the institutional arrangements for more effective use of water, the volume focuses on the neoclassical analysis of the competing demands for water. The result is a useful summary of the mainstream economic findings about water and its management.

Organisation of the volume is in two separate, but related parts. The first part is a review of economic methods for valuing natural resources, whereas the second part addresses the application of those methods to valuation of water in its various uses. At a glance, it may seem that the exposition in the first part is a fairly standard and not particularly exciting overview of a well-known set of methods, but a careful read leaves a different impression. Contributing to this is the classification of economic methods for valuing water in a novel and unconventional dichotomy of inductive and deductive methods. Instead of the usual distinction between normative and positive methods, the book classifies the methods according to their place in the philosophy and methodology of scientific inquiry. The desirable and undesirable characteristics of the deductive methods (residual claimant, mathematical programming, CGE) and the inductive methods (econometric analysis, nonmarket valuation techniques) are presented in detail.

This classification feeds into the question of *ex ante* versus *ex post* valuation of water. Inductive methods are often preferred by economists because of their reliance on observational data, but the analysis conducted using these methods is inevitably an *ex post* one. Extrapolating *ex ante* based on *ex post* analysis, which is often needed in water policy studies, can sometimes be problematic. This is witnessed by anyone who has observed a poor 'out of sample' prediction performance of otherwise sound econometric models. Indeed, if one subscribes to the rational expectation hypothesis, then one might expect the deductive methods to perform better in an *ex ante* analysis, given that they are in essence designed to mimic 'rational' economic behaviour.

Several other questions of perspective are cleverly presented in the text. One is the long-run versus short-run standpoint in the valuation of water resources, and another is the at-site versus at-source valuation of water. The

discussion conveys that the value of water will depend on both the temporal and spatial aspects. It also accentuates the recent trend in water economics literature to classify various quantities of water according to their end destination such as water withdrawn, water delivered, and water consumed.

The detailed presentation of individual methods for valuing water begins with the review of the residual claimant method where the value of water is determined as a residual after the contribution of all other production factors have been taken into account. This method, often banished from an academic economist's toolbox perhaps because of its simplicity, is re-introduced and critically examined in the text. Even after considering the ample criticism that the residual claimant method is subject to (such as treatment of own inputs and aggregation problems), it is shown that there are instances when this method can be appropriately used, providing for simple, quick and cost-effective analysis. A related method of assigning value to water through the resource rent is also reviewed and its use in the cases where water can be treated as a relatively fixed input is reaffirmed.

The author is particularly critical of the simplified value-added analysis within input-output models that is often used as a basis for benefit-cost analysis of water development projects. The 'multipliers' resulting from this method are dismissed as inappropriate measures of the value of water that often tend to overstate benefits from the proposed project.

The overview of the inductive methods highlights the standard features of econometric modelling (production function and derived demand function estimation) and provides a good presentation of the methods typically classified as non-market valuation techniques (contingent valuation, choice modelling and travel cost method). These methods and their potential use in water economics are described at a level comparable to any introductory to intermediate level text in environmental economics. Particular emphasis, and it seems quite rightly so, is given to the hedonic property valuation method. Property transaction data can often be observed and 'attribute pricing' can be used to deduce the capitalised value of water from that data. Despite this, there have not been many hedonic valuation studies related to irrigation agriculture reported in the literature.

Meta-analysis is another important and relatively novel method. This method relies on statistical techniques to conduct analysis using data published in previous studies. It is based on similar theoretical foundations as benefit transfer, and can produce powerful conclusions with no additional data requirements.

In the second part of the book, the author describes how the methods thus presented can be used for valuing water in its alternative uses. A major portion is devoted to valuation of water in irrigated agriculture, where the site-specific nature of the value of water in irrigation is emphasised. The discussion then includes a debate of the neo-physiocratic versus neoclassical views on irrigation. Even though volumes of neoclassical economics work have repeatedly pointed to the key economic principles that should guide development and

management of irrigation agriculture, we still observe significant presence of the neo-physiocratic approach in practice, where irrigated agriculture is viewed as a driver for economic development. Unfortunately, this is often the case in developing nations that experience high population growth and where competition among various potential uses for water resources is expected to be fierce in the near future.

Discussion on the application of individual methods for valuing water takes the form of a published works review. The breadth of published works covered is quite extensive, which makes this book a very useful reference for anyone interested in water economics. Again, there is an emphasis on the hedonic pricing method for valuing irrigation water. The application of this method is presented in great detail, and examples from past studies are provided. Other methods are presented in a standard fashion, but the examples used for illustration make the discussion interesting and easy to follow.

Another distinctive contribution of this volume is its challenge to the conventional wisdom of attributing high value to water used in speciality crops (e.g., horticulture, viticulture) and livestock production. It is argued that the high value attributed to water in these activities is a result of omitting other important factors, such as capital, risk, and managerial skills. This implies that water is not always a limiting factor for expansion of speciality crops or livestock production and that many water development projects falsely account the benefits from these activities.

The penultimate two chapters focus on industrial and municipal demands for water. Published work dealing with these water-consuming sectors has traditionally been focused on the estimation of water demand functions. This has particularly been the case with municipal water use, where price elasticities of demand are important indicators that can be used for effective demand management. Several problems with the estimation (e.g., simultaneity under the block rate structure, marginal versus average pricing) are well described and analysed. Apart from the standard discussion on industrial uses of water, the value of water in hydropower generation and the value of water in transportation (e.g., canals, rivers) are investigated.

In the final chapter, the author discusses the value of water as a provider of numerous public goods. It seems that this classification is oversimplified, since it covers as diverse values as recreational benefits, property values, water quality issues, and flood alleviation values all in one place. More structured discussion, separating these into in-stream demands for environmental flows and demands for publicly provided services, would have been preferred. Nevertheless, the exposition within the chapter is relevant, well illustrated with examples, and provides a good coverage of the literature.

In summary, *Determining the Economic Value of Water* is a well-written, well-organised and useful book. It can certainly be used as a valuable collection of relevant references in water economics. Substantial parts of it can be used for undergraduate teaching in specialised water economics units or in

more general natural resource economics units. Finally, it can be used by practising economists, and by non-economists, for guidances in conducting studies related to various uses of water.

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Natural Resource Management in Agriculture: Methods for Assessing Economic and Environmental Impacts, edited by B. Shiferaw, H.A. Freeman and S.M. Swinton. Published by CABI Publishing, Wallingford, Oxfordshire, UK, 2005. ISBN 0 85199 828 3 (hdbk), £65.00.

Natural Resource Management in Agriculture is an edited and multi-disciplinary volume of 16 chapters that were originally presented at a workshop in December 2002 held at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Not surprisingly, many of its authors work at or are affiliated with the international agricultural research centres that are part of the Consultative Group on International Agricultural Research (CGIAR). Given the background of the authors, many of the examples are taken from developing countries, but the techniques and methods are equally applicable to developed economies, including Australia.

The importance of the book is clearly stated in the opening chapter where the authors estimate that up to 1.2 billion hectares of land has been degraded as a result of human activity. In turn, this land degradation is estimated to have had direct negative effects on about a billion people in over 100 countries. The aim of the editors and contributors of the book is to address this problem by reviewing approaches to measure and assess various impacts on agricultural and environmental systems so that decision makers can monitor performance and improve sustainability outcomes.

The 16 chapters in the book are grouped into five parts: one, an overall introduction (chapter 1); two, specific introductions to economic valuation (chapter 2), soil quality measures (chapter 3), water availability and quality measures (chapter 4), and ecosystem services (chapter 5); three, reviews of how econometric techniques (chapter 6), economic surplus approaches (chapter 7) and bioeconomic modelling approaches can be used to assess the natural resource impacts of different agricultural practices; four, applications of techniques discussed in part three applied in different contexts (chapters 9–13); and, five, overview of integrated natural resource management (chapter 14), review of natural resource impact assessment research at CGIAR centres (chapter 15), and a concluding summary and ‘where do we go from here’ (chapter 16). This selection provides a veritable smorgasbord for the enterprising reader, but because of its breadth it is unlikely that all the chapters will be of interest to any one reader.

The target audience is essentially students and practitioners of various disciplines in agriculture who want to better understand and apply a variety of techniques to assess the biophysical and economic effects of agricultural practices. It will be of greatest use to researchers/practitioners who need a practical guide about how to evaluate the economic impacts of different agricultural practices such as loss of soil quality and soil erosion, or how to value new agricultural technologies, techniques and interventions.

Given the multidisciplinary nature of the book and its aim to guide practitioners, several of the chapters cover material that would be at the level of third- or fourth-year undergraduate courses in environmental and resource economics. The biophysical chapters on soil quality (chapter 3) and water quality and availability (chapter 4) are also elementary, but provide very helpful introductions to those not trained (such as this reviewer) in the physical sciences. Of all the introductions to economic theory and practice, chapter 7 is a standout that clearly explains in a step-by-step way how to use econometric analysis to undertake natural resource impact assessment.

The greatest value of the book comes from the application of the techniques in a variety of contexts. In particular, the chapters on valuing soil loss and quality in Ghana, Mexico and India (chapter 9), assessing the impact of watershed management projects in India (chapter 10), valuing innovations to groundnut production in India (chapter 11), and simulating the adoption and impact of two land and water management options in the Ethiopian Highlands (chapter 12) all provide useful guides about how to apply the techniques, and the pitfalls.

The book delivers a very useful and practical guide. At almost 400 pages and 16 chapters in length there is probably not much more that could have been fitted into a single volume. At the risk of appearing churlish, however, it would be helpful to briefly review what is missing from the book in the vain hope that this review might be read by someone who wishes to extend the work.

Both the social dimension of household production and social networks have been shown to be very important in terms of adoption and changing agricultural practices, but is essentially ignored in the book. Another important gap is the absence of any discussion on systems dynamics. This approach to modelling is widely used in the natural sciences for evaluating different scenarios and can be very useful in giving insights to 'what if' type questions. Given the great deal of uncertainty about the effects of different natural resource management interventions, and also the importance of thinking about the system-wide implications of agricultural practices, its omission is unfortunate.

Perhaps the most glaring omission in the book is any real discussion of the policy and institutional context in which natural resource management occurs. Bringing about on-the-ground change in natural resource management is about getting farming households to change or improve current practices. This is, essentially, about policy interventions that change the incentives and, thus, behaviour of people. Such policy might be as straightforward as eliminating subsidies for certain inputs, or it could be much more involved such as changing water management practices for an entire catchment. Whatever

the policy change, the point is that the research does not stop at assessing the possible impacts of a practice, but must include from the very beginning an analysis and consideration of how desired practices can be implemented.

To illustrate the importance of the research-policy interface, some 20 years ago this reviewer was involved in a Farming Systems Research and Extension Project in Haiti. One of the project's interventions was to assess the impact of building rock walls (a very labour-intensive and expensive activity) on reducing soil erosion and improving farmers' incomes. To no one's surprise (least of all the farmers) the rock walls were found to be beneficial to farmers if someone else incurred the cost of building them. However, the research did not take the next step in formulating how rock walls could be built in the absence of outside financial support given that farmers lacked the resources to do the construction without outside assistance. By failing to consider what interventions could practically be implemented (the Ministry of Agriculture had no budget for rock-wall building or for almost any other activity) the research provided little added value in terms of practically addressing the single most important factor in terms of land degradation in Haiti: soil erosion from farming. In other words, resolving natural resource management problems is not so much about researching and generating 'solutions' to 'technical' problems, but is about integrating knowledge to address 'adaptive' problems that requires effective connections from land user to researcher to policy maker. This context is sadly missing in a book that tries to enhance the effectiveness of interventions to address worldwide environmental and resource challenges associated with agriculture.

Despite the caveats about what is missing, or should be included in future CGIAR volumes or workshops on environmental impacts in agriculture, the reader can be assured that what is in the book is well done and will be of considerable value to those who face the difficult task of improving resource and environmental outcomes in agriculture. To any one who is serious about practically analysing the agriculture-environment interface, this book will be a valuable addition to the office shelf.

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Collapse: How Societies Choose to Fail or Survive, by Jared Diamond. Published by Penguin Group, Camberwell, Australia, 2005, pp. xi + 575, [24] p. of plates. ISBN: 0 71 3998628 (pbk), A\$32.95.

Jared Diamond has superb narrative skills. He writes with warmth, empathy and sagacity. He is a Pulitzer Prize-winning author who knows how to grab and keep hold of the reader's attention. He is eclectic: his three careers span physiology, ornithology and environmental history.

In *Collapse*, he imaginatively reconstructs the decisions facing extinct settlements to explore the reasons for their demise. Within the narrative art, he recreates leaders and subordinates living in a world of changing circumstances. He leads us through the rising tensions that these societies would have faced and speculates as to how they responded. Consider his analysis of two different societies in Greenland. The Norse survived 450 years (longer than Western society has been in North America so far, as the author points out) before their demise in the 15th century as a result of climate change. Diamond regards the length of Nordic survival in this harsh environment as impressive. Nevertheless, they could have done better. They made bad choices. For example, they chose not to eat fish, perhaps because a chief in the early years suffered a bout of food poisoning that entered local folklore.

Diamond uses five sets of factors to explain the collapse of societies. These are environmental damage, climate change, hostile neighbours, decreased trade with friendly partners, and finally, the response of a society to its problems. In the case of the Norse in Greenland, the second and fourth factors conspired together against the settlers, as climate change during the Little Ice Age froze the sea passages, leading to cessation of trade with Norway. Unsustainable sheep and cattle grazing and excessive use of turf for use on buildings in the settlement damaged the environment. And although there was still opportunity to emulate some of the survival strategies of the Inuit, concerning diet and other aspects of resource use, the Norse chose not to. Indeed, the limited evidence indicates that the Norse showed contempt and violence towards the Inuit.

The Inuit survived somewhat better and remain in Greenland today, after eight centuries. Diamond's narrative is never quite black and white. Success is not absolute or guaranteed, although factors may result in a higher or lower probability of a society's survival. He cites the examples of starving Inuit staggering into Danish settlements (several centuries after Norse settlements had died out) after all other members of an Inuit settlement had died of starvation.

Diamond examines both past societies and modern societies. His case studies include Easter Island and other remote Pacific settlements, the Anasazi of the US south-west (600 to 1200 AD), Viking settlements, and Norse Greenland. His modern case studies include the genocide in Rwanda in 1995, explained partly as a Malthusian crisis brought about by a population explosion. He contrasts two sides of one island, destitute Haiti and the Dominican Republic, which has fared somewhat better.

The chapter of most interest and controversy to *AJARE* readers is that on Australia. In concentrating on this chapter, I will fall far short of doing justice to the astonishing breadth of this book. Among many other themes, case studies and examples, the book includes interesting observations on environmental practices, both good and bad, in mining operations.

Before discussing the chapter on Australia, it is worth noting Diamond's views on technology. To him, technology is a mixed blessing, as new technologies

bring both benefits and unanticipated new problems. New technologies have also brought some of the great blunders of the past few decades. The harmful effects of chlorofluorocarbons (CFC) were discovered in 1974, yet DuPont, the largest manufacturer of them did not cease producing them until 1988, and they are still being made in some parts of the world. Diamond also discusses the motor vehicle, initially praised as being quiet and clean, attributes we tend not to associate with motor transport now. He has little faith in technology as a means of solving environmental problems.

When it comes to Australian agriculture, Diamond paints in part a bleak picture. He cites the disastrous introduction of rabbits and foxes to Australia, in the first place to emulate some characteristics of Europe. He discusses the practice of subsidised land-clearing that prevailed until several decades ago. He mentions growing problems with land and water salinity. The nation has relatively shallow, infertile soils and limited water resources. However, he sees hope:

Perhaps more than any other First World citizens known to me, Australians are beginning to think radically about the central question: which of our traditional core values can we retain, and which ones instead no longer serve us well in today's world? (p. 379)

Diamond speculates that Australia may eventually become a net importer of food. He fails to provide any statistic to back this. Although it is true that agriculture's share of national income has shrunk from over 20 per cent after World War II to around 3.5 per cent now, this trend is typical of many growing economies. Another statistic provides an entirely different perspective: in the past 25 years, Australia's agricultural output has doubled (ABARE 2004, table 18), a growth rate far in excess of that of the population. This chapter is quick to point to apparent subsidies and distortions that have led to agriculture being practised over a larger than otherwise proportion of the nation's land area. *AJARE* readers know that Australia is neither unique nor exceptional in the use of farm subsidies among Western nations. It is difficult to escape the conclusion that the author has underestimated the contribution made to Australia's agricultural production by technological change. The growth in Australia's agricultural output (far more rapid than any increase in exploitation of land resources) also makes it difficult to assert that Australia's agricultural sectors are unsustainable. Diamond has not used statistics to discipline his assertions.

Diamond suggests that the nation's sustainable population level is only 8 million. Does he mean to imply that technological change, legislation and improved environmental management cannot contribute to sustainability? Some aspects of technological change for the better are quite apparent to casual observers. Thirty years ago, any drought in Australia reduced some paddocks to a series of sand hills on lighter soils, and churned up endless dust storms elsewhere. Although drift and dust storms have not been entirely eliminated

from farmland, utilisation of minimum tillage and bans on land clearing have diminished the problem considerably since then.

Marohasy (2005) has prepared a detailed rebuttal of Diamond's chapter. Although I cannot agree with every point she makes, her article provides statistical backing that leads her to rather different conclusions than Diamond. Readers who wish to explore further should consult her article. She cites soil improvement through the widespread use of clovers in refuting Diamond's prognosis concerning Australian soils. *AJARE* readers are well acquainted with many examples of statutory bodies, research institutions and community groups that deal with ongoing rural and environmental challenges. Diamond underestimates the mainstream role they are playing in farming sustainability.

Diamond's thesis is that a study of extinct societies provides us with many lessons for today's societies. Isolated, barren Australia might seem a reasonable example of a nation facing environmental doom. For a short time, as I read the chapter while flying out of Australia in June, I was a captive audience. The Flinders Ranges looked particularly miserable after almost 10 months without rain. Within days, the season had broken in south-eastern Australia, and I felt more optimistic: to a considerable extent, I think Diamond's chapter has missed the mark. However, I would recommend *Collapse* to an *AJARE* audience, as the reader is unlikely to respond with indifference.

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