

MARKET BASED INSTRUMENTS TO ACHIEVE SUSTAINABLE LAND MANAGEMENT GOALS

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ABSTRACT

Sustainable land management is complex and requires the coordinated effort of all beneficiaries of the use of land. The role of economists in natural resource management is essentially threefold. The first is to analyse the nature of problems in natural resource management, and to understand how the related institutions and markets operate. The second is to assess how people feel about the state of the environment, so that judgements can be made of whether the current allocation of resources reflects community expectations. In the third, economists design policies and incentive structures to resolve conflicts in resource use and guide resource allocations toward a socially optimal level.

There is a developing interest in Australia in the use of incentive based policies to deal with widespread natural resource management conflicts. A preference by governments for market-like mechanisms to achieve targeted outcomes indicates a growing realisation that the regulatory controls adopted in the past are less effective. The focus of emerging policies is to provide better incentives to land managers and individual resource users to encourage practices that may lead to greater individual and collective benefits. Key benefits of using market-like mechanisms are that the desired outcomes are met at minimal costs and that participants have the flexibility to vary their involvement to better suit their individual circumstances. A key role for governments is to define rules for the market-based mechanisms and to stimulate desirable dormant activities through targeted incentives.

INTRODUCTION

Combating dryland salinity is a challenging and complex natural resource management issue. Over the past decade there has been substantial investment of public funds into understanding and addressing the issue in Australia, yet the impacts of salinity are continuing to worsen (Pannell 2001). Salinity will impose costs on many Australians through impacts on biodiversity, infrastructure and production. Prospects of significant production losses are looming, and there are continuing calls for public investment in addressing salinity impacts.

Economists have several roles to play in the debate over salinity. First, economists can highlight the social causes of salinity – which are largely the result of inappropriate incentives. Then economists can help land managers and governments in identifying where and when it is appropriate to commit public funds to prevent or mitigate salinity. Given the benefits of land management accrue to the present owners and future populations, economists

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also can help identify the appropriate formula for cost sharing. A further role is to identify potential solutions in the context of social change, or to devise appropriate institutional frameworks and regulatory and incentive mechanisms to bring about change.

In this paper, the focus is on the use of market-like mechanisms to transfer better signals and incentives to land managers. Yet, given the complex nature of the land management problem a multifaceted approach is often needed. Following a broad overview of the economic perspective of the salinity management challenge, we outline some issues that confront the use of market based instruments and how some challenges could be accommodated in a coordinated policy response. In conclusion, attention is drawn to the pivotal role markets play in social coordination and the crucial need for effective governance and appropriate institutions to minimise the risk of failure in market-led resource allocations.

ECONOMIC ANALYTICAL FRAMEWORKS

Salinity issues have normally been presented as cases of negative externalities (Pannell, McFarlane and Ferdowsian 2001), or non-reciprocal externalities (Quiggin 2001). In either case, they are unintended consequences of conscious management decisions. In the case of salinity, activities such as tree clearing and inappropriate farming and irrigation practices have caused imbalances in ground water systems. Modified concentrations of natural salts across the soil profile are viewed as potential pollutants. The changed water balance and pollution outcomes often occur downstream, on other farms or on public land impacting on production levels, infrastructure and biodiversity. A large proportion of salinity impacts may occur on-site, rather than external to a farm, and be more properly be classed as sustainability issues (Pannell et al. 2001).

In the conventional view, externalities are a form of market failure, where there is no automatic process by which farmers will consider the flow-on consequences of their actions such as adding to the salinity problem. From this perspective, salinity problems occur because farmers respond to the commercial benefits of actions that cause salinity, but do not bear the consequences as these occur at some other location or time. Historically however, farmers were pursuing rightful commercial activities and they were not led to consider the flow-on consequences of their actions – both positive and negative. The society that benefited from farm production supported the farming practices, through research and technology, but failed to foresee the consequences on future productivity, essentially because land was in plentiful supply. In many cases there may have been net economic benefits from resource development when only minor salinity impacts were a consequence.

Society has only recently begun to embrace the pursuit of sustainability. As a result, there is more acceptance of limits to growth, and more understanding that growth may be mitigated by environmental and other costs. Modern social responsibility, built largely on reciprocity and mutual benefits, also requires individuals to be more concerned and avoid potential harm. Social customs, ethical beliefs and individual interests are driving the political, legal and the commercial environment toward preventing harm and minimising mutual losses. From this perspective, salinity problems need to be viewed broadly as a consequence of social change. Mutual responsibility and compliance to standards widely promoted as a means to overcome major social implications of indirect individual actions may work in tandem with other processes in managing salinity.

In view of promoting compliance and greater participation, externalities can be seen as outcomes of existing regulatory and incentive structures that deliver a set of goods and services in a particular combination, involving desired and undesired attributes (Cornes and Sandler 1996, Randall 1999). Mitigation of the externality therefore entails examining alternative arrangements for providing goods and services in a manner most acceptable and affordable to all stakeholders. This approach presents a new scope for policy analysis, where economists work with scientists, industry and the rest of the community to facilitate desirable social change. The focus therefore is moving away from income growth to stability of incomes and sustaining living standards. The role of the market, as a coordinating mechanism of individual preferences remains crucial in the hunt for lasting and ongoing solutions. The solutions lie in promoting efficient markets, understanding the limits of markets and employing other social devices to encourage markets to fully account for both desirable and undesirable attributes of goods and services.

DRIVING SOCIAL CHANGE IN LAND MANAGEMENT

Governments facilitate and regulate markets, and invest in the interest of society. Therefore, governments have several ways to address problems in resource allocation: For example, governments can:

- (a) influence the norms of society through education, incentives and suasion;
- (b) change the property rights – i.e., modify the rights and responsibilities of affected parties;
- (c) facilitate enterprise and innovation through investment in social capital;
- (d) signal the external costs through mechanisms such as taxes and charges; and
- (e) use direct regulation, planning and enforcement to constrain harmful activities.

In a broad sense, all the above activities that governments undertake on behalf of the society represent the institutional setting. This institutional setting defines the ‘operational freedom’ for all individuals and firms that make production and consumption decisions. An undesirable level of externalities in an economy thus indicates an inadequacy in government policy to keep up with the changing societal aspirations.

In correcting externalities, governments need to weigh up the costs of correction against the benefits achievable. It is neither possible, nor economical to eliminate externalities. It is economically efficient to abate an externality to the extent that the costs of abatement equal the benefits achievable. Numerous difficulties, relating to the measurement of costs and benefits, constrain the application of this logic. Economists therefore seek policies that guide social behaviour towards the efficient end rather than reaching predetermined optima. The chosen policy mix at any given time represents political perceptions of social expectations, competing priorities for public investment and is bound by the existing knowledge and technology. Nature and diversity of the Australian landscape imposes further difficulties.

The challenge for the governments, therefore, is an ongoing one. A balanced response would involve strategic measures to enhance the scope of management and a mix of incentives to guide the transition to a desired state. In terms of policy design a wider choice of instruments is therefore desired.

CHOICE OF ECONOMIC INSTRUMENTS IN LAND MANAGEMENT POLICY

Economic instruments guide choices between alternatives by influencing either the quantities used, the cost of using resources or the benefits attached to production or consumption by changing relative prices. They differ in action to direct regulatory prohibition by leaving individuals or firms the ultimate choice. Thus economic instruments induce behavioural change by modifying incentives for production and consumption. The end result is a net improvement in benefits through avoidance or discouragement of undesirable choices and mitigation or rehabilitation of the impacts of choices that are too costly to avoid.

Economic instruments indirectly regulate individual choices to achieve collective benefits. In most cases, they restrict certain economic activities that are beneficial to individuals by imposing incentives (positive and negative) to achieve an outcome of greater public benefit. A useful example is the tax on leaded petrol.

In the case of salinity, there are three broad explanations of why farmers may engage in unsustainable practices:

- lack of information about possible consequences of particular actions;
- uncertainty about the likelihood of salinity occurrence; and
- the effect of discount rates.

The effect of discount rates often means that commercial benefits in the short term outweigh future costs that occur over the longer term. Sometimes it is in farmers' financial interests to undertake salinity causing actions (and in a smaller number of cases it may be economically efficient to undertake these actions). Where salinity results from information gaps or problems of uncertainty, carefully defined economic instruments can guide resource use decisions in the interest of the society. The major obstacle, however, is to address the issues of inequity and fairness which can severely influence the political acceptance of the economists' remedy.

Commonly used economic instruments in natural resource allocations include Pigouian taxes, access charges and related property rights mechanisms. However, there are particular difficulties in correcting externalities associated with salinity. Setting appropriate taxes and incentive payments is difficult because of information constraints and transaction costs in enforcement and compliance. Even if taxes can be set on input uses that are easy to administer, Pigovian taxes may not be sufficient to change the behaviour of land managers (Pannell et al. 2001). The property rights approach may not be appropriate if impacts occur over long time horizons (Pannell et al. 2001), or involve asymmetric externalities (Pincus 2002, Quiggin 2002).

For these reasons there is a growing interest in seeking voluntary compliance through targeted incentives that are linked to verifiable performance standards. The objective of such policies is to enhance productivity through compliance with standards and to seek new standards to achieve further productivity improvements.

Another useful development that is directly linked to performance measures is risk assessment and assurance, which provides a means to match standards to variable resource conditions. For instance, matching land uses to resource capability, land set aside, retirement and precision enhancement offer extended scope for land management where both economic instruments and knowledge-based systems can be employed to achieving greater efficiency in resource use and production (Mallawaarachchi et al 2001).

Continued success in minimising externalities in resource use lies in the ability to capture and enhance future benefits. This is particularly relevant in agriculture, where many activities with low environmental costs are often regarded as expensive, or undesirable for generating income and employment. Focus on innovation in creating new goods and services, and in achieving multiple benefits or economies of scope are important elements in the pursuit of balanced policy (Strappazon et al 2003).

The role of government in sustainability issues is less straightforward than when verifiable externalities are involved. This is because most resource uses involve losses as well as gains. One argument is that current intervention may avoid future calls for public funding to address sustainability impacts. Also, government intervention may be required to speed up adoption of more efficient management practices. Yet, budgetary constraints drive allocation decisions along social priorities. For instance current focus on border security will constrain funds for other purposes. In this context policies to guide social change for greater individual responsibility will benefit from a clearer understanding of community preferences for resource management.

ASSESSMENT OF COMMUNITY PREFERENCES

Public funds have been committed at different levels of government to salinity issues. An appropriate way of justifying that commitment is to assess the benefits and costs involved. The cost of salinity programs is the sum of direct financial costs and the value of in-kind support provided by communities, land managers and governments. The assessment of benefits is often more difficult, and may involve several different categories. Yet for efficient use of funds, the public or community values for these benefits need to be assessed.

One benefit of avoiding or mitigating salinity impacts is the value of agricultural production created. The appropriate measure is the net value of production (after accounting for costs of production), discounted to present value terms. An alternative method of valuing production benefits is to estimate the impacts on land values of mitigating or protecting against salinity impacts. However, other factors that affect the market value may distort the result. Another benefit measure is the reduced impacts on infrastructure. Replacement values can be used to assess the benefits of reduced damages to buildings, roads, sewerage works and other assets. Biodiversity protection is the other major benefit of salinity mitigation. Non-market valuation techniques such as contingent valuation or choice modelling are best suited to assess community preferences for protection from salinity impacts.

THE DESIGN OF INCENTIVE BASED POLICIES

There is a heightened interest in the use of market based instruments for natural resource management in Australia (Van Bueren 2001, Productivity Commission 2001). There are many ways in which the Government can fully engage the private sector in helping to protect natural resources. These include the removal of regulatory constraints, the clarification of

¹ The reports are available electronically from <http://www.rirdc.gov.au/reports/AFT/01-162.pdf> and <http://www.pc.gov.au/research/commres/hpscb/index.html>.

rights and responsibilities for conservation, and the establishment of cost sharing principles (Productivity Commission 2001).

Additionally, there are opportunities to create new markets to facilitate resource protection. These are termed natural resource trading models. These forms of market based instruments are an alternative to direct regulation that operates within a structure of property rights and rules for trading behaviour. Instead of directly regulating resource use, in these systems, governments create the environment for market based transactions that offer incentives for appropriate resource use. The essential element in these models is the creation of conditions to increase the scarcity value of a bundle of resources.

There are many examples of market based systems applied to environmental issues in industrial settings. A successful example is the ‘permits to pollute’, where an emission in a particular area or industry are capped, and permits are issued on a pro-rata or other agreed basis. Firms needing to increase emissions have to buy permits from other firms. The price of credits would rise to the point where other firms find it profitable to reduce their own pollution levels (perhaps by closing down an older plant or installing new technology). Once a reduction has been made, firms are then able to sell their excess credits. The price set in the market for the permits signals the level of financial returns in reducing emissions. An excellent example of this approach is the sulphur emissions trading market in the United States, which has been more successful and cheaper in reducing sulphur dioxide emissions than the previous regulatory approach (Stavins 1998, Schmalensee et al 1998). Another example is the salinity trading scheme in the Hunter Valley (See Box 1).

Box 1 – Salinity Credits in the Hunter Valley

<http://www.epa.nsw.gov.au/licensing/huntersalinity.htm>

In the Hunter River in New South Wales, the amount of saline water that can be released down the river system is highly variable according to the level of flow. There are a number of coal mines in the basin, as well as other industries, and permits to ‘trickle’ saline water into the river system meant that salinity threshold levels were often exceeded. Some way needed to be found to coordinate releases of saline water (best when river levels were high after initial flushes had passed), and to share opportunities for releases (particularly when new mines were opening).

A system of salinity credits has been operating since 1995. Opportunities to discharge saline water (from mines and other sources) are distributed according to a market mechanism. Approximately 1000 salt ‘credits’ have been established, and these can only be used when the river levels are at ‘high’ or ‘flood’ levels. Any new entrants or industry wishing to discharge more saline water must purchase salt credits from other operators within the basin. In this way the amount of saline water that can be released into the system is capped.

The resulting value of pollution permits in these systems provides incentives to minimise emissions. Firms that can reduce emissions at a lower cost can make further profits by selling their surplus pollution permits to other firms. The private incentives created to reduce emissions also operate to provide a public good – such as reductions in acid rain from lower sulphur emissions. The use of a market mechanism means that firms can pursue their own profit objectives, but that emission reductions are made in the most cost-effective manner.

Application of market based instruments in natural resource management is currently limited. The use of Individual Tradeable Quotas (ITQ) in the fishing industry and the establishment of water markets and pricing reforms in the water sector in Australia are two notable examples of trading models being applied to achieve sustainable resource use. In the past, governments have tended to focus on regulation for environmental management, possibly because land management tends to be state and local government responsibilities. This has begun to change recently (Van Bueren 2001, AFFA 1999). For instance introduction of a cap for irrigation water allocation in the Murray Darling Basin in 1996 offered an additional incentive to manage water efficiently. While water pricing have sent signals to irrigators about improving water use efficiency, ITQs have improved the conditions of fisheries. These initiatives have reduced resource exploitation and increased the scarcity value of resources.

Under a cap-and-trade mechanism, land managers would be given permits for water infiltration, or other contributions to the salinity risk. Land managers who did not fully use their permit could sell the excess to those who require extra permits. Wider application of cap-and-trade mechanisms is constrained by the difficulties in defining, measuring and auditing salinity contributions accurately, and the paucity of short term mitigation options.

EMERGING FORMS OF MARKET BASED INSTRUMENTS

Market based instruments are not new, and taxes, subsidies, market premiums and insurance bonds have been applied in the past in natural resource management. The newer forms such as cap and permit trades, auctions/tenders for covenants or agreements, mitigation banking and transferable development rights are yet to see wider acceptance in resource management in Australia.

Auctions and tenders

Auctions and tenders are competitive processes to generate better returns for public spending. Many research grants and development rights are allocated through a competitive bidding process. Similarly, tenders might be called to provide a certain area of forest for catchment protection/water quality purposes. The major advantage in allocating funds in this form is that the opportunity costs for landholders to tradeoff production against protection become transparent. When the tendering process is ongoing (e.g. through the annual allocation of funding), variations in those tradeoffs over time become more apparent. Achieving best results from these initiatives does require clearer definition of rights (Strappazzon et al 2003).

Baseline and credit

This is a variation on the 'cap and trade' model, where a baseline level of environmental conditions are established for a firm, and improvements on this level generate environmental credits (Van Beuren 2001). Firms keep the credits they earn or sell them to other firms wishing to exceed the baseline, or 'bank' them in the event that they exceed their own baseline in some future time period. These schemes offer improvement on direct regulation and provide firms with incentives exceed targeted standards. This model is successfully used in the Everglades Agricultural Area for phosphorus emission management. Albeit difficulties, an application to the salinity issues might involve giving land managers credits where particular remedial actions (such as the planting of perennials) are adopted.

Offsets and credits

Offset and credit schemes provide mechanisms for transferring development opportunities or environmental impacts across locations, time or firms. For example, carbon offset schemes encourage opportunities for carbon sequestration (e.g. in forestry plantations) as offsets against existing or increased emissions from industrial sources (Box 2).

Box 2 – Carbon Credits – sourced from Hassall and Associates (1999)

In July 1999, the Tokyo Power Electric Company (TEPCO) entered into an arrangement with NSW State Forests to plant eucalyptus, pine and other trees on 1,000 hectares in 2000, and to increase plantings to between 10,000 and 40,000 hectares by 2009. TEPCO will own the carbon rights in the areas planted, while NSW State Forests will manage the plantations.

In a similar example, Pacific Power purchased the carbon rights to 1,000 hectares of forest from NSW State Forests. The trade was for a two year period, with first rights of refusal for the following nine years. Pacific Power paid \$4 (Australian) for every ton of carbon dioxide equivalent that would be sequestered. The amount contracted in the first two years was 25,300 tons of carbon dioxide equivalents, rising to 198,000 tons in the remaining nine years.

There is scope for applying this system in irrigated areas to manage salinity. A salinity offset system would operate by requiring land managers to supply or purchase offsets for any new salinity-inducing developments. Land managers who could supply reductions in salinity impacts may be able to register these as credits, and then offer them for sale. An offset program would not be as general as a cap-and-trade or baseline-and-credit mechanism, but would still face many of the same definition, measurement and auditing issues.

KEY BENEFITS OF USING MARKET BASED INSTRUMENTS

The main advantages of establishing market trading systems for managing natural resources are that they:

- allow for more flexibility of resource management;
- provide incentives to individuals and firms to minimise emissions or achieve natural resource outcomes;
- allow for specialised knowledge to be applied at the operational level to minimise emissions or achieve natural resource outcomes;
- achieve outcomes at lowest cost; and
- are more adaptable to changed conditions.

Market based instruments are often more suited for implementation at the local or regional level. This is because the incentives that face resource users are less likely to vary across a particular region, making it easier to introduce trading rules that do not create perverse outcomes. Many examples of the application of market based incentives come from local, catchment or regional areas. The disadvantages of basing actions at a smaller level is that it sometimes reduces the number of participants available, and that the expertise is often missing to establish market based instruments and make them work.

One key advantage of basing market based instruments at the catchment or regional level is that they allow for effective community and stakeholder consultation. There are many options for setting the standards that might take effect (i.e. the levels of the caps or floors), for the types of instruments that might be applied, and the rules that govern their usage (i.e. the rules for trades, penalties for non-compliance). Consultation with stakeholders is important if a new system is to be implemented effectively and trades are to occur.

IMPLEMENTING MARKET TRADING SYSTEMS

The market based mechanisms aims to address the public good characteristic of many natural resources that limits incentives for individuals to invest in the protection of natural resources. Referred by economists as *nonexcludability* of benefits and the *nonrivalry* in consumption, these problems often lead to free riding of benefits. Unlike producing a marketable commodity like potatoes and tomatoes, those who wish to invest in protecting natural resources tend to gain only moral satisfaction. The commoditisation of natural resources by defining attributes of bundles of natural resources, access rights, responsibilities of use and setting limits to availability, will help modern market based mechanisms to overcome the traditional problems of natural resource allocation. As these arrangements tend to reallocate resources from the public domain (free access) to private domain (user pays), equity issues and the overall net benefits of these measures remain areas of controversy.

Van Bueren (2001) identifies several attributes of successful market trading systems for natural resources overseas. He emphasises that enforceable caps are the key to creating markets that also rely on the creation of appropriate property rights so that assets can be held and traded, reflecting supply and demand conditions. Because of the difficulties in overcoming existing interests and the potential to create perverse incentives as a result of compromise, it appears more effective to start from scratch than to make adjustments to existing programs.

The potential success of trade depends on the ability of the trading partners to maximise mutual benefits. There has to be enough variation in opportunity costs and abatement costs to make trades between firms worthwhile. If salinity abatement costs do not differ between land managers, there are no potential gains in transferring reduction goals between them.

The success of a trading system is dependant on stakeholders and participants accepting the targets and trading rules involved. Many items, such as the setting of an enforceable cap, can be controversial and difficult to implement. Involving stakeholders and participants in the design and planning process is important to generate familiarity and to set rules that will encourage maximum involvement. Measurable and verifiable goods and simple trading rules that minimise barriers to entry in the new market can maximise participation. .

LIMITS TO MARKET TRADING SYSTEMS

Market trading systems are not appropriate for all natural resource allocations (Pannell 2001b). In some cases, there are difficulties in specifying property rights, and in identifying and monitoring changes. When the costs of discovering, making and enforcing transactions (transaction costs) are too high, then the market processes tend to be less effective. Advances in communication (e.g. internet) which reduce transaction costs can facilitate transactions

between disparate parties. Advances in scientific knowledge and resource monitoring (e.g. satellite data) make it easier to identify and monitor changes.

Market based solutions will be easiest to apply in situations where:

- there is adequate scientific knowledge about the issues, and cause and effect parameters;
- there are a wide variety of opportunity costs involved, so that there are clear economic benefits in shifting responsibilities between groups and individuals;
- the rules for trading are simple and transactions are easy to implement;
- there are a number of potential buyers and sellers who will participate in the market; and
- there are greater opportunities to increase economic activity.

CONCLUSIONS

Sustainable use and management of natural resources is an ongoing challenge, which requires coordinated strategies and operational responses. The best-known coordinated system that the society has constructed and managed individually is the market. While markets have largely been the catalyst for enhancing benefits of efficient resource allocation, markets have been deficient in expressing the undesirable impacts of inefficient allocations that result primarily from ill-informed decisions. As markets coordinate decisions between consumers and producers trying to maximise the value in individual benefits, enabling markets to capture and reflect the currently unaccounted insidious processes in value determinations would provide a reliable mechanism to maintain social well-being.

A key role for governments is to define rules for effective market-based mechanisms and to stimulate desirable dormant activities through appropriately designed incentives. By default, all social processes are subject to correction as society evolves and more information comes to light. Effective governance is therefore essential at all levels of social organisation to establish reliable controls to minimise the risk of failure in market-led resource allocations. Standardised business processes led by greater scientific understanding, verifiable and enforceable rights and responsibilities of resource ownership would mitigate risks and improve overall effectiveness of individual and collective decisions. More responsible decisions, screened by the market viability test in a well-functioning market will enhance broader social values and ensure resource sustainability.

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