

Longer-term Issues in Queensland Rangelands – An Economic Perspective

Jon Stanford

jonstan2@bigpond.net.au

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Introduction

Short-term issues tend to dominate discussion of the rangelands, but longer-term issues relating to declining consumption of beef and climate change are explored in this paper. Climate change is explained as the existence of large-scale externalities from the use of fossil fuel. Climate free of negative effects is an international public good which requires combined international cooperation to achieve and maintain, especially as the ‘free-rider’ problem acts to prevent this. The nature of economic models of climate change is explained. Although national governments have been loath to commit to international cooperation, international financial organisations such as the International Monetary Fund and The World Bank recognise that climate change is a serious and important problem. Together with national financial regulators such as the Bank of England, these financial bodies have determined that climate change is to be seen as presenting financial risks from the destruction of assets resulting from extreme weather events and the transition to a carbon-neutral future. Consequently, financial institutions are reluctant to insure some events and locations. Moreover, banks assess positions relying on fossil fuels more strictly, leading to unwillingness to provide finance for certain projects and industries. However, an increased supply of finance to industries in transitioning to a carbon-neutral future is available, and new

sources of finance for the same purpose are becoming available. Pastoralism on the rangelands finds itself faced with these risks and the prospect of being denied insurance and bank finance.

The Rangelands Declaration (in these *Proceedings*) identifies an agreed position of industry, natural resource planning and the science of the situation facing the rangelands and their communities:

Ongoing decline in these communities due to unrelenting economic pressures, a legacy of unfortunate planning and legislation, and the lack of bold, forward-looking policy choices; The compounding effects of a highly variable climate that is expected to become hotter and increasingly variable, with more severe episodes of flood and drought, and persistent ecosystem stress.

This analysis takes up these two issues: first, the economic pressures shaping the long-term development of the beef industry; and second, the economic issues with climate change. Economic analysis of climate change is based on the identification of climate change as market failure; burning fossil fuels has a negative externality, and the agents burning fossil fuels do not pay the full economic price of their activity but reap the profits from that activity. The economic solution is to place a price on greenhouse gas emissions

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by a carbon tax. Further economic analysis has to determine the benefit of this intervention via a benefit cost analysis. The response of national governments to calls for coordinated international action has been tepid at best and hostile at worst. However, an interesting development has been the acceptance by the international financial sector of the seriousness of climate change and its seeing climate change as a trend giving rise to financial risks that have to be dealt with through established financial processes. This change has been driven by financial regulators whose actions can cause financial entities to adopt more serious attention to assisting the move to carbon-neutral economies.

The economic importance of the rangelands includes the production of beef. Cattle production, as well as providing for the domestic market, is oriented to the export markets of live cattle and processed beef. Long-term dietary changes, such as a switch by consumers from red meat to white meat and an increasing adoption of vegetarian or vegan diets, place downward pressure on the domestic market demand for beef. Increased concern for animal welfare is an influence on the export market in the long term. Calls for dietary changes towards plant-based foods rather than animal foods, to offset the effect of climate change, may have a negative effect on export demand.

Major short-term issues are the highly variable and severe weather conditions of floods and drought. In early 2019, North Queensland experienced severe flooding which resulted in significant economic loss including the loss of over 600,000 cattle and 1500 kilometres of fencing. Longer-term issues include identifying the adaption strategies to both of these weather events to achieve sustainable management when climate change is predicted to exacerbate extreme weather events.

Current Pastoralism in the Rangelands

The major economic activity in the Queensland rangelands is pastoralism. As of 2018, there were

11.9 million cattle, 50.0% of the Australian total, and 2.2 million sheep, 3.1% of the Australian total (ABS, 2019). Major areas of beef production in Queensland are the northern area which specialises in cattle breeding and the live export trade, manufacturing beef and cattle fattening; and the southern area which fattens cattle for processing and export as boxed beef (Queensland Department of Agriculture and Fisheries, 2018).

Most enterprises are family owned, but there are some large corporate bodies such as the Australian Agricultural Company which is listed on the Australian Securities Exchange. Beef processing is highly concentrated, with three major firms accounting for 65% of the market (Meateng, 2018). Cattle have traditionally been traded in saleyards, but their importance has been eroded by vertically integrated beef supply chains.

Dietary Changes

Consumption of Beef

Over the period 1974–1975 to 2016–2017, consumption of meat in Australia has increased from 109.8 kg per person to 110.2; however, the composition of consumption has changed markedly. In the beginning of the period, beef accounted for 63.4 kg per person, but at the end date only 25.4 kg, a decline of 60%. The proportion of beef in total meat consumed fell from 58% to 23%. Lamb and mutton declined from 23 kg to 8 kg, a fall of 67% over this 42-year period. Pig meat consumption increased from 9 kg per person to 25 kg, a change of 64%, while chicken increased from 10 kg per person to 44 kg, an increase of 76%. The implication of these changes for the beef industry is that it has become relatively more reliant on exports (ABARES, 2018).

Vegetarianism

There has been a consistent trend in Australia for people to consume diets that are predominately vegetarian. In 2012, 1.7 million people (9.7% of the population) identified as vegetarian; in 2014, 2.2 million (11.2%) did so and, in 2018,

2.5 million (12.1%) so identified (Roy Morgan, 2019). Nearly 2.5 million Australians (12.1% of the population) now have diets in which the food is all, or almost all, vegetarian, up from under 2.2 million (11.2%) in 2014; this continues the trend shown in previous surveys.

Animal Welfare

Surveys find that there is increasing concern about animal welfare in Australia. Futureye (2018) found over 90% of people consider farm animal welfare a concern. The level of concern is mainly determined by awareness of specific animal and agricultural practices, heightened by more media coverage into such issues as live export transport conditions and battery cage chickens. People also express distrust of the industry and government when it comes to the welfare of farm animals. This distrust seems to be fuelled by the perception that there is a lack of transparency and that certain information may be kept hidden intentionally, or deliberately obscured (Futureye, 2018).

More Effective Management of Crown Land by Reforming Pastoral Leases

Pastoral leases have a long history in Australia, being designed to promote pastoral pursuits. The land under pastoral lease is a public asset, and it is the responsibility of the Queensland Government to manage the lands for the benefit of the ultimate owners of the land, the people of Queensland. Over 60% of Queensland's rangelands is held under pastoral lease tenure from the Queensland Government. Pastoral leases were designed to promote pastoral production through providing an adequate economic living area. The current form of pastoral leases may not be suitable in circumstances of major climate change. Negotiated new lease conditions and new types of leases could encourage adaptation to climate change and incorporate policies to allow regeneration of pastures to absorb carbon and to provide economic stewardship of ecosystem services across the rangelands.

Economic Insights into Climate Change

A landmark report on the economics of climate change was the Stern Review (Stern, 2007), although there was earlier work on the economics of climate change, especially Nordhaus (1991). The extensive and detailed Stern Review received extensive international attention. The Review accepted the scientific findings on climate change in the following terms: "The scientific evidence is now overwhelming: climate change is a serious global threat, and it demands an urgent global response." The overriding finding of the Review was "that the benefits of strong and early action far outweigh the economic costs of not acting". Using economic models, the Review estimated that the costs of action to reduce greenhouse gas emissions to avoid the worst impacts of climate change could be limited to around 1% of global GDP annually. This is a material cost but contrasts sharply with the estimates of damage, which could be expected to reach 20% of GDP.

An important insight was that the Stern Review considered climate change to be the greatest market failure of all time. This result exists because burning fossil fuels create a negative externality, i.e. costs which are not borne by the economic agent burning the fuel but have to be met by the community at large. The solution to this problem is for governments to impose a carbon tax on the use of fossil fuels to ensure that the activity of burning fossil fuels meets the full economic costs. Without a carbon tax, private decisions to use fossil fuels will ignore the negative effects and use too much fossil fuel.

William Nordhaus, who shared The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2018, concluded his Nobel Lecture with four steps for today:

1. People must understand the gravity of global warming. This involves intensive research and resisting false and tendentious reasoning.
2. Nations must raise the price of CO₂ and other greenhouse-gas emissions.

3. Policies must be global and not just national or local.
4. Rapid technological change in the energy sector is essential.

Nordhaus points out that climate without negative effects is an international public good which all nations can enjoy, even if they do not pay the costs of ensuring the climate is free of negative effects. An international public good has the characteristics of non-rivalry in consumption, i.e. consumption by one nation will not reduce consumption by any other party; and non-excludability, i.e. it is not possible to exclude one nation from enjoying the good climate. The difficulty with creating an international public good is the free-rider problem, such that one nation may not pay their share of the costs but still enjoy the benefits. It is to the selfish advantage of each country to be a free-rider; if all nations act in this way, no agreement can be reached to create and maintain the international public good. The standard response of a free-rider is to claim that its emissions are small in relation to total emissions, e.g. say 1.3%, so it doesn't matter if this nation doesn't meet its share of the costs. If other nations take this attitude, no agreement for united action is possible. Nordhaus proposes as the solution the creation of a club: nations join a climate change club, and those refusing to join are subject to economic sanctions decided by the members. Sanctions could take the form of, for example, tariffs on the free-riders' exports.

Economic Models of Climate Change

Economic models of climate change are in a class of models referred to as the Integrated Assessment Model (IAM) which, as its name suggests, assesses the costs and benefits of climate change. There exist a large number of IAMs; the most famous is the Dynamic Integrated Climate and Economy model (DICE), developed by Nordhaus (2018). DICE is a highly aggregated dynamic growth model (a somewhat less aggregated model is RICE, where the "R" is

for regional) which incorporates a damages function derived from the scientific climate change model to calculate endogenously the damages from climate change.

DICE is dynamic, i.e. all variables carry a date (most economic models are comparative static and analyse a parameter shift or a change in exogenous variables to determine the result of the induced change on endogenous variables). General equilibrium models, widely used in economics, are comparative static and do not show the path of adjustment. Economic output is determined by an aggregate production function, and the damages caused by climate change are modelled as a quadratic function of the rise in temperature. Damages can be reduced by expenditure on the abatement of climate change. The essence of DICE is to maximise economic welfare, which is increased by increased output but reduced by damages. The two major uses of DICE are to calculate the social cost of capital (SCC) and to evaluate the different policy prescriptions. In 2018, Nordhaus reported a carbon price of US\$50.00 per tonne of carbon, which is much higher than existing carbon taxes; this reflects the loss of time in implementing significant carbon abatement schemes after the warning was sounded by Stern in 2007. More recent calculations (IMF, 2019) put the preferred carbon price at US\$75.00. The point of the carbon price is to increase the cost of products produced by burning fossil fuels. This will induce economic agents to switch from these products to one which uses less fossil fuels. The criticism of a carbon tax is that it may disadvantage low-income earners, especially in the transitional period. As a carbon tax would raise substantial revenue, it is open to subsidise low-income earners, to subsidise the production of alternative sources of energy from renewable sources, or to reduce other taxes. Implementation of a carbon tax does not necessarily imply an overall increase in taxation as there is a general agreement that the proceeds of a carbon tax could be returned to low- and medium-income earners. An important

implication of Nordhaus is his characterisation of a climate which does not produce damages as an international public good. The public good requires international cooperation and some mechanism to avoid the free-rider problem under which the selfish response is not to contribute to solving the climate change problem but to accept the benefits.

Estimates of SCC (Social Cost of Carbon)

The standard units of emission costs and benefits are dollars per tonne (1000 kilograms) of CO₂ emissions avoided. The social cost of carbon is an estimate of the net present value of monetised social damages from emission of an additional tonne of CO₂. An estimate in 2017 by the US government, under the Obama administration, gave the social cost of carbon as approximately US\$46.00 in 2017 dollars for a tonne of emissions. The effect of burning one gallon of petroleum gasoline produces roughly nine kilograms of CO₂, so a social cost of carbon value of US\$46.00 per tonne of CO₂ corresponds to US\$0.41 per gallon. Carbon dioxide is only one of many greenhouse gases; others include methane, nitrous oxide and hydrofluorocarbons. It is conventional to convert costs for reducing non-CO₂ greenhouse gases into CO₂ equivalent units.

Role of Financial Sector

It is clear that there is resistance by some nations to entering into binding arrangements to reduce the effects of climate. The IMF (2019) claims: “Limiting global warming to 2°C or less requires policy measures on an ambitious scale, such as an immediate global carbon tax that will rise rapidly to \$75 a ton of CO₂ in 2030.” This contrasts sharply with the fact that “the average price on global emissions is currently \$2 a ton, a tiny fraction of what is needed for the 2°C target”. In the absence of international agreement and coordination, there are developments in the financial sector which ensure that there are changes to increase the costs of ignoring climate change.

Regulators, which have oversight of banks, insurance companies and pension funds, have moved to the position that climate change must be treated as a trend superimposed on the existing cyclical variations in weather. In addition, regulators consider that climate change involves financial risks which financial institutions must take into account in their business operations. The risks arise firstly from extreme weather events which increase losses: clearly, insurance companies can be expected to experience higher losses from floods, hurricanes, cyclones and other weather disturbances; banks will find that the value of the securities as collateral for loans will reduce in value, threatening their profits and stability; and pension funds, which take a long-term view of investing, will divest their portfolios of investments which rely on fossil fuel consumption and will be unwilling to enter into new investments the basis of which is fossil fuels. Secondly, financial institutions see risks in the transition to a low-carbon economy, being wary of ‘stranded assets’ such as coal-fired electricity plants. However, the new view from the financial sector is not all negative; profitable business opportunities are seen to exist in the transition to low-carbon economies such as alternative energy, local energy networks and electric vehicles.

Green Bonds

In November 2008, The World Bank issued a new financial product, a Green Bond, a fixed-term debt instrument. Innovative features of the Green Bond were the provision of criteria for eligible Green Bond projects and the assurance, through a second-party opinion, that eligible projects would address climate change. Standards for Green Bonds were coordinated by ICMA, the International Capital Markets Association. The World Bank has raised the equivalent of US\$12.6 billion through 150 Green Bonds in 20 currencies (World Bank, 2019).

In 2014, The World Bank issued the first Kangaroo Green Bond, denominated in AUD.

This issue was taken up by a number of investors including four Australian fund managers, an insurance company, QBE Insurance Group Ltd and two superannuation funds, Local Government Super and UniSuper. UniSuper had been refining its Socially Responsible investments to include Green Bonds. Overall, 42% of the bonds were placed with asset managers, 35% with superannuation funds, 20% with insurance companies and 3% with banks. The geographic distribution was: 77% of the bonds placed with Australian investors; 10% with investors in Japan; 2% with investors in Asia; and 11% with US investors (World Bank, 2014).

UK Regulators' Response to Climate Change

In the UK, the major regulators of financial institutions, the Prudential Regulation Authority (part of the Bank of England), the Financial Conduct Authority, the Financial Reporting Council and The Pensions Regulator, in a joint statement in July 2019, stated: "Climate change is one of the defining issues of our time. We recognise it presents far-reaching financial risks relevant to our mandates."

The Bank of England's strategy for responding to climate change is:

- to engage with regulated entities on climate change risk; and
- to enhance the resilience of the UK financial system to climate change by supporting an orderly market transition to a lower-carbon economy (Scott et al., 2017).

Task Force on Climate-related Financial Disclosures

Further action is being taken by the private sector under the Task Force on Climate-related Financial Disclosures (TCFD) sponsored by the G20. TCFD's recommendations about disclosure on climate change are being followed by corporations whose balance sheets total US\$120 trillion. Eighty per cent of the top 1100 G20 companies now disclose climate-related

financial risks, while investment managers with 45% of global assets under management now support shareholder action on carbon disclosure. The Bank of England states that almost three-quarters of banks are starting to treat the risks from climate change like other financial risks, rather than viewing them simply as a corporate social responsibility. Banks have begun to consider the most immediate physical risks to their business models: from the exposure of mortgage books to flood risk to the impact of extreme weather events on sovereign risk. And they are taking steps to assess exposure to transition risks in anticipation of climate action. This includes exposure to carbon-intensive sectors, consumer loans for diesel vehicles, and mortgages for rental properties, given new energy efficiency requirements.

Australian Prudential Regulation Authority (APRA)

In Australia, the Australian Prudential Regulation Authority (APRA), the regulator of financial institutions, has expressed its position on climate change in the following terms:

Over recent years, APRA has highlighted the financial nature of climate change risks to its regulated entities. APRA has advised that these risks are material, foreseeable and actionable now. Awareness and understanding of these financial risks have clearly increased during this time. A critical paradigm shift has occurred due to the work of industry, domestic and international supervisors and regulators, as well as other key stakeholders. Climate change is increasingly seen as a material prudential risk. A shift from awareness towards action in response to these risks is underway.

A survey of 38 large regulated entities (most of the financial sector) undertaken by APRA in 2019 found that a high level of awareness of climate change risks was shown across the ADIs (Authorised Deposit-taking Institutions,

or what other people would call banks), general insurance and superannuation industries. All institutions in these industries were taking steps to improve their understanding of climate-related financial risks. General insurers are at the forefront in extreme weather events, drought, floods and associated events such as bushfires, and the extent of their losses from these events will influence future premiums and insurability. The 2019 floods in North Queensland have led to an upward review of insurance premiums. The Anglican Diocese of North Queensland reported: “... we are facing increases in our property insurance premiums of over 500%. At present we pay \$124,000 for our public liability insurance and approximately \$501,000 per annum for insurance premiums, including two of our schools. Our property insurance is due to increase to \$2,650,000 on 1st November 2019.”

The Reserve Bank of Australia

The Reserve Bank of Australia states: “Climate change is exposing financial institutions and the financial system more broadly to risks that will rise over time, if not addressed.”

Risks such as rising sea levels and an increase in the frequency and intensity of extreme weather (including storms, heatwaves and droughts) will create both financial and macroeconomic risks (RBA, 2019). The Reserve Bank suggests climate change be treated as “a trend in contrast to droughts which have been thought of as cyclical events.” In addition, it has to be considered that climate events are more frequent, more severe and more long-lived. What is critical is the process of adaptation of the economy to climate change; an abrupt transition creates more economic difficulties than a gradual” and “We need to think in terms of trend rather than cycles in the weather. Droughts have generally been regarded (at least economically) as cyclical events that recur every so often. In contrast, climate change is a *trend* change. The impact of a trend is ongoing, whereas a cycle is temporary.”

Financial Developments and the Rangelands

Consideration of climate change cannot be local; climate change itself is global and a successful challenge to climate change must be global. The convergence of approach to climate change by international financial organisations and national regulators is significant as it indicates possible future developments. The major developments are that:

1. Insurers will scrutinise their exposure to areas affected by severe weather events; in extreme cases some assets and activities may become uninsurable.
2. Banks will become increasingly reluctant to lend on projects which are influenced by climate change.
3. Existing lenders may look more favourably on activities promoting climate change.
4. Innovations in the capital market may lead to greater funding for projects assisting in the transition to a carbon-neutral economy.

The economic costs of the North Queensland floods in 2019 shed some light on the possibilities of the future. Heavy rain in North Queensland, which set many records, caused severe flooding resulting in extensive damage to infrastructure and station property. Total stock losses are estimated at 664,000, including 48,000 sheep with a value of \$800 million. In addition, it was estimated, by the industry body AgForce, that more than 10,000 kilometres of fences were swept away, 15,500 kilometres of private roads were damaged, as were 1000 kilometres of water pipelines and 778 watering troughs (Major, 2019). Confirmation of these damages was provided by the Australian Agricultural Company’s 2019 annual report (AACo, 2019). AACo, a publicly listed corporation, operates four stations in North Queensland and assessed the flood event as the “worst on record”. Of the 82,000 cattle held on the stations, 43,000 were lost at a value of \$45.6 million.

Conclusion

Several aspects of the demand for beef have been examined, and it is clear that domestic beef consumption is on a secular downwards trend. The export market remains strong, but there are community concerns about animal welfare. As all enterprises in Australia operate with a social licence, the behaviour of the enterprises has to accord with community expectations.

Much of the discussion of the rangelands deals with short-term effects such as floods and drought, which have substantial economic costs. However, the longer-term issue of climate change is relatively ignored. As much as denialism is the fashion, events globally are treating the attempts to deal with the effects of climate change seriously. Despite the inactivity of politicians in Australia, the financial sector is developing a unified and consistent approach to dealing with important issues. Economic activity in the rangelands is exposed to heightened risks of being denied insurance cover and access to finance.

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Author Profile

Jon Stanford is a retired academic economist who is interested in the economics of climate change.