BOOK REVIEW

MARY J ANGELO AND ANÉL DU PLESSIS, *RESEARCH HANDBOOK ON CLIMATE CHANGE AND AGRICULTURAL LAW* (EDWARD ELGAR, 2017)

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MICHAEL BLAKENEY

Climate change and agriculture are interrelated. Temperature and rainfall changes impose obvious stresses upon the growth of crops and livestock, but they also contribute to plant diseases and pest infestation. At the same time, agricultural practices contribute to climate change by the utilisation of water, emissions of greenhouse gasses and the conversion of marginal land into arable land. This book looks at the extent to which agricultural laws and policies can address climate mitigation and adaptation.

The opening chapter by Professor Angelo surveys the link between climate change and food security. Key ingredients in this relationship are the one-third growth of global population by 2050 at a time when climate change is reducing land available for cultivation. The solutions proposed in this chapter are greenhouse gas mitigation strategies and adaptation strategies, principally through land use planning. An adaptation strategy which is hinted at, but not discussed in the book, is the breeding of plant new varieties and the possibility of the compulsory licensing of useful varieties.

Climate change and agriculture under the United Nations Framework Convention on Climate Change (UNFCCC) is addressed by Jonathan Verschuuren in chapter 2. His depressing conclusion is that the UNFCCC "unfortunately does not provide a powerful stimulus to adopt and implement climate smart agriculture policies, and there is little attention to reducing emissions from agriculture".

The resilience and transformation of agro-ecosystems in the face of climate change is explored by Lance H Gunderson in chapter 3. He looks at the response of agriculture to major pest infestations, and plant diseases, as well as the

adoption of new crops such as sugar. The responses to these incidents, he suggests carry useful policy lessons for the current climate change problems.

The application of governance theory to climate-related agricultural changes is explored by Paul Martin in chapter 4. He introduces to governance theory, "autopoeisis", or the ability of systems to generate internal change. He concludes with the positive observation that incremental climate-friendly agricultural practices and supply-chain strategies can reduce the climate footprint of agriculture.

The role of water law in agriculture is detailed by Robert W. Adler in chapter 5. He looks at the domestic water law of the USA as an example, as well as international water law. He concludes that significant adaptations will be needed in the laws and institutions governing water resources to address the expected impacts of climate change on agriculture.

In chapter 6, Elodie Le Gal looks at climate change and Australian invasive species law.

A potentially important solution to the climate change problem is the genetic modification (GM) of crops. This is examined by Rebecca M Bratspies in chapter 7. She suggests that the claims for this technology " have been extravagant" and that track record of GM crops is "tepid". Notwithstanding her pessimism, life sciences companies have been busy patenting so called "climate ready genes", such that for example approaching 80 per cent of the rice genome is the subject of patent applications by those companies.[1]

Keith H. Hirokawa looks in chapter 8 at adapting agriculture to climate change through land use controls. This chapter looks mainly at US examples, including the Climate Change Adaptation Plan of the Environmental Protection Authority.

A US perspective is also taken to intensive animal agriculture and methane emissions by Michelle Nowlin and Emily Spiegel in chapter 9. Their general conclusion is that the US livestock industry has been slow to change its production and management practices to adapt to climate change. To some

[1] See M. Blakeney 'Climate change and gene patents' (2012) 1(2) *Queen Mary Journal of Intellectual Property*, 2.

extent this is because of technological difficulties, but in chapter 10 Christian Häberli describes the adaptation of agricultural trade and investment rules to climate change. Then in chapter 11 J.B. Ruhl looks at agriculture and payments for ecosystem services in the climate change era.

The shift of food producers into biofuels is a factor exacerbating food insecurity. Sérgio Sauer and colleagues in chapter 12 describe the shift of Brazilian sugar producers into agrofuels.

The role of law in assisting smallholder farmers to adapt to climate change in Kenya is described by Robert Kibugi in chapter 13. At the time of writing the relevant legislation was yet to be enacted: the Climate Change Bill 2014, although there are a number of national policies which have a potential bearing on the subject.

A direct conflict between agriculture and the extraction of energy resources is seen in the exploitation of coal seam gas in rural areas. This conflict in Australia is discussed in detail in chapter 14 by Amanda Kennedy and Amy Cosby, which looks at the North-West region of NSW as a case study. Other Australian examples which might be explored are its debates over carbon pricing and carbon sequestration.

In the final chapter, Akachi Odoemene looks at the inter-relationship between climate change and land acquisition. He suggests that land grabbing has been exacerbated by the increased demand for food and thus has a relationship with climate change, much as the slave trade had with colonialism.

This book is a useful introduction to the research which is being undertaken in the area of climate change and agricultural law. A subject which might have been addressed in this space is the relationship between climate change and food waste. A 2013 FAO report *Food wastage footprint: Impacts on natural resources* estimated that the direct economic cost of food wastage of agricultural products (excluding fish and seafood) was about $US 650 billion, equivalent to the GDP of Switzerland. The United Nations Secretary-General's High-Level Panel on Global Sustainability estimated that food wasted by consumers in high-income countries is roughly equal to the entire food production of sub-Saharan Africa and that the water used for irrigation to produce the food which is wasted annually would be enough to meet the domestic water needs of 9 billion

people..[2] Food waste also has significant environmental impacts. Rotting food produces an estimated 3.3 billion tonnes of greenhouse gases, approximately 14% of the world's CO2 emissions.[3] Food left to rot in landfills also impacts land biodiversity around the landfill, polluting waterways and groundwater. Thus, reducing food waste can go some way towards meeting the shortfall in food supplies which is in prospect.

[2] UN Secretary-General's High-level Panel on Global Sustainability, *Resilient People, Resilient Planet: A future worth choosing,* United Nations, New York, 2012.
[3] FAO, *Global food losses and food waste – Extent, causes and prevention*. FAO, Rome, 2011, 36.