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Growing Together: The Impact of the Regulation of Non-Innovative Activities on Agricultural Innovation Governance

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ABSTRACT

This article focuses on one of the most hotly contested interfaces around innovation—that between the organic sector and agricultural sectors that adopt innovation, using two case studies: genetically modified crops and nanotechnology. Through an analysis of four supranational and national regulatory frameworks for organic agriculture the article demonstrates how important difficulties are caused for innovation governance by regulations meant for non-innovative activities. These difficulties adversely impact consumers and the feasibility of coexistence between innovation adopters and non-adopters. More broadly, the article demonstrates why regulatory frameworks for non-innovators should be included in innovation policy considerations.

KEYWORDS: innovation, organic, genetic modification, nanotechnology, coexistence

1. INTRODUCTION

Innovation is critical to economic success[1] and new technology is fundamental to innovation.[2] Successful introduction of new technologies requires effective governance, including regulatory regimes to protect human and environmental health and safety.[3]

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1 Department of Prime Minister and Cabinet, *National Innovation and Science Agenda* (Australian Government 2015) 3.

2 Department of Agriculture, Fisheries and Forestry, *National Food Plan, Our Food and Future* (Australian Government 2013) 43.

3 See, for example, re the introduction of nanotechnology: Royal Society and Royal Academy of Engineering, 'Nanoscience and Nanotechnologies: Opportunities and Uncertainties' (Report, July 2004); US Food and Drug Administration, 'Nanotechnology: A Report of the US Food and Drug Administration Nanotechnology Task Force' (Report, 25 July 2007); Nanotechnology Workgroup, Science Policy Council, 'Nanotechnology' (White Paper, United States Environmental Protection Agency, February 2007); European Commission, 'Accompanying Document to the Communication from the Commission to the European Parliament, the Council and the European Economic and Social Committee — Regulatory Aspects of Nanomaterials: Summary of Legislation in Relation to Health, Safety and Environment Aspects of Nanomaterials, Regulatory Research Needs and Related Measures' SEC (2008) 2036. For a discussion of attempts in various jurisdictions to begin to regulate now for future technologies, see Karinne Ludlow and others, 'Regulating Emerging and Future Technologies in the Present' (2015) 9 NanoEthics 151.

However, concerns about innovation extend beyond safety risks.[4] Provision for consumers and industry to choose whether to adopt innovation is a fundamental concern. But while the role of regulatory regimes for new technologies in directing innovation and protecting (or not) the interests of those who choose not to adopt innovation has been well discussed, the reverse is not true. The impact of regulatory regimes targeting so-called non-innovative activities on innovation governance is often ignored.[5] This article addresses that impact by focusing on one of the most hotly contested interfaces in the balancing of innovation and choice—that between the organic agricultural sector and those agricultural sectors that adopt innovation. Two new technologies are used as case studies: genetically modified (GM) crops and nanotechnology.

The article begins in Section 2 by providing context around organic and innovation adopting agriculture and the resulting coexistence problems. Section 3 provides a primer on the regulatory frameworks for GM crops and nanotechnology. Section 4 then maps the governance terrain for organic agriculture. Through analysis of four supranational and national regulatory frameworks for organic agriculture—those of the European Union (EU) (with a focus on the United Kingdom (UK)), United States of America (USA), Canada and Australia—the article demonstrates in Section 5 that important difficulties are caused for agricultural innovation governance by regulations meant for non-innovative activities. Such difficulties arise from the inclusion of varying private standards in organic regulatory frameworks, lack of clarity in the standards, and inconsistencies in terminology and regulatory content. Conclusions and recommendations for improvements in the way jurisdictions approach the regulatory challenges of future innovation governance are brought together in the final section.

2. THE BATTLE-'FIELD'

GM crops were first sold commercially in 1996 and are the fastest adopted crop technology in recent times, reaching a global hectarage of 179.7 million in 2015.[6] Mostly broad acre crops such as canola, soy and corn, GM crops raise particular challenges for non-adopters because of their broad scale production in the open environment, and their harvest and trade as bulk commodities. Nanotechnology, a newer agricultural innovation, can be expected to become of increasing agricultural importance through improved or novel functionality of pesticides, herbicides and environmental sensors and use in processing and production equipment.[7]

4 US, National Research Council, *Understanding Risk: Informing Decisions in a democratic society* (National Academy Press 1996); Karinne Ludlow, Stuart Smyth and José Falck-Zepeda (eds), *Socio-Economic Considerations in Biotechnology Regulation* (Springer Books 2014).

5 Whether it is appropriate for non-adopters of a particular innovation to share responsibility for successful introduction of the innovation into society is an interesting question, but is not considered here.

6 Clive James, '20th Anniversary (1996 to 2015) of the Global Commercialization of Biotech Crops and Biotech Crop Highlights in 2015' *ISAAA Brief* No 51 (2015), <www.isaaa.org/resources/publications/briefs/51/executivesummary/default.asp> accessed 6 July 2017.

7 For current and potential uses see Australian Pesticides and Veterinary Medicines Authority, *Nanotechnologies for Pesticides and Veterinary Medicines: Regulatory Considerations. Final Report* (Australian Government 2015) 1.5–1.6. The technologies are explained in section 5.2 below.

In contrast, organic agriculture, an older form of production, had a global hectarage of 50.9 million in 2015.[8] Although often referred to as being about product quality, organic agriculture is a value based production system.[9] Essentially, 'organic agriculture is based on minimizing the use of external inputs, avoiding the use of synthetic fertilizers and pesticides'[10] although the production process used by individual farmers varies according to local conditions.[11] As discussed below, organic standards prohibit the use of GM crops and set tolerances for GM crop presence on organic farmland or in organic produce.[12] Prohibitions around nanotechnology are also now being introduced into organic standards and provide an interesting example of the evolution of organic standards in the face of agricultural innovation.[13]

There are benefits and disadvantages to both organic and innovative agricultural practices.[14] It is not the purpose of this article to assess these but it is important to note that both forms of agricultural practice are supported by government and the public, albeit to different degrees in the various jurisdictions.[15] Inevitably though, innovation adoption impacts those who choose not to adopt and the balancing of one person's desire to adopt innovation with another's desire not to adopt it is a central issue relevant to any transformative innovation. In the agricultural sector, possible negative impacts for non-adopters go beyond the usual competitive risks raised by modern technology, such as computers created for typewriter manufacturers: GM crops and nanotechnology may impact farmers' ability to farm organically at all. Unsurprisingly, there are different societal responses to these problems but one

8 The term 'organic' was probably first coined in 1940, although its foundational principles were developed before that time. J Heckman, 'A History of Organic Farming: Transitions from Sir Albert Howard's *War in the Soil* to USDA National Organic Program' (2006) 21 Renewable Agriculture and Food Systems 143, 146. The statistics are for *certified* organic only and are the most recent figures available. Helga Willer and Julia Lernoud (eds), *The World of Organic Agriculture. Statistics and Emerging Trends 2017* (Research Institute of Organic Agriculture (FiBL), Frick, and IFOAM –Organics International 2016) 25.

9 See for example, Food and Agriculture Organisation (FAO), *Organic Agriculture and the Law* (Legislative Study no 107 2012) 13.

10 Codex Alimentarius Commission, *Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods* CAC/GL 32-1999 <www.codexalimentarius.org/standards/list-of-standards/> accessed 6 July 2017, Foreword [6].

11 The organic industry is strongest in the EU in terms of the proportion of organically to conventionally managed land with 6.2% of EU farmland being organically managed in 2015. The proportion is 5.6% in Australia, 1.4% in Canada and 0.6% in the USA. Willer and Lernoud (n 8) 46.

12 For scientific developments that could be permitted under organic principles, see Martin Marchman Andersen and others, 'Feasibility of New Breeding Techniques for Organic Farming' (2015) 20 Trends in Plant Science 426.

13 Matthew Kearnes and others, 'From Bio to Nano: Learning Lessons from the UK Agricultural Biotechnology Controversy' (2006) 15 Science as Culture 291.

14 Joseph Kiefer, 'Turning Over a New Sprout: Promoting Agricultural Health By Fostering the Coexistence of Organic and Genetically Modified Crops in the Wake of *Monsanto Co v Geertson Seed Farms* and the Deregulation of Modified Alfalfa' (2012) 61 Emory LJ 1241, 1251–52.

15 See Department of Agriculture, Fisheries and Forestry (n 2) 43; Canada is developing its first national food plan - Ann Hui, 'Why a New National Strategy on Food Can't Satisfy All' *The Globe and Mail* (Toronto 24 Oct 2016) <www.theglobeandmail.com/news/national/why-a-new-national-strategy-on-food-cant-satisfyall/article32486906/> accessed 6 July 2017; European Commission, EU Science Hub <https://ec.europa.eu/jrc/en/research-topic/agricultural-technological-innovation> accessed 6 July 2017; US, Department of Agriculture, *Strategic Plan FY 2014-2018*, Goals 1 and 3 https://www.usda.gov/sites/default/files/documents/usda-strategic-plan-fy-2014-2018.pdf accessed 10 July 2017.

commonality is coexistence strategies. The European Coexistence Bureau, established by the European Commission to address coexistence issues in the EU, defines coexistence in this context as 'the ability of farmers to choose between the cultivation of [GM] and non-GM crops in compliance with the relevant legislation on labelling rules for GM organisms (GMOs), food and feed and/or purity standards'.[16] Whether coexistence is actually feasible or welfare enhancing is beyond the scope of this article. But innovation is needed for global food security and successful coexistence secures the opportunities offered by both forms of agricultural practice.[17]

Coexistence measures have been introduced by industry and government.[18] The focus of these has largely been on the responsibilities of those wanting to adopt innovation. Difficulties caused by regulatory frameworks targeting non-innovation adopters are rarely acknowledged. The Commission's recommendations on the issue for example, recognises that Member States need flexibility to be able to take into account the 'particular local needs of conventional, organic and other types of crops'.[19] However, there is no exploration of the difficulties regulatory regimes for such crops may cause for those drafting coexistence measures or regulatory frameworks for innovation.

The organic industry is itself calling for governance measures to respond to their choice not to adopt innovation, including changes to GM crop regulation to accommodate organic agriculture, GM crop farmer liability if organic land is contaminated and compulsory insurance for GM crop farmers.[20] However, as shown below, their own regulatory regimes cause difficulties for those tasked with creating or implementing such measures. They also create uncertainties for organic farmers.

At the international trade level, consistent thresholds for the presence of GM material in non-GM grain shipments are being called for to address the growing problem of countries rejecting imported grain when small or low-level traces of GM grain

16 European Coexistence Bureau, 'Background' <http://ecob.jrc.ec.europa.eu/background.html> accessed 6 July 2017.

17 The Royal Society, 'Reaping the Benefits: Science and the Sustainable Intensification of Global Agriculture' (Policy document 11 September 2009) 8. As to the welfare implications of coexistence, see Volker Beckmann, Claudio Soregaroli and Justus Wesseler, 'Coexistence' in Stuart Smyth, Peter Phillips and David Castle (eds), *Handbook on Agriculture, Biotechnology and Development* (Edward Elgar 2014) 386–87.

18 See for example, Pew Initiative on Food and Biotechnology, *Peaceful Coexistence Among Growers of Genetically Engineered, Conventional and Organic Crops* (Washington DC 2006); Single Vision Grains Australia, *Delivering Market Choice with GM Canola* (2007); European Commission, 'Commission Recommendation on Guidelines for the Development of National Co-Existence Measures to Avoid the Unintended Presence of GMOs in Conventional and Organic Crop' COM(2010)200 final,1; USDA, Advisory Committee on Biotechnology and 21st Century Agriculture (AC21), *Enhancing Coexistence: A Report of the AC21 to the Secretary of Agriculture* (19 November 2012) 8; USDA, Advisory Committee on Biotechnology and 21st Century Agriculture (AC21), 'Stakeholder Workshop on Coexistence', Docket No APHIS-2013-0047, 80 Federal Register (3 February 2015), 5729–31. For further on coexistence and the policy behind it, see Nicholas Kalaitzandonakes and others (eds), *The Coexistence of GM, Organic and Conventional Foods* (Springer 2016).

19 European Commission, ibid, recital 7.

20 European Commission, 'Proposal for a Regulation of the European Parliament and of the Council on Organic Production and Labelling of Organic Products (repealing Regulation 834/2007)' COM(2014) 180 Final, art 20(3), discussed in section 5.3.

is found.[21] Negotiations around the Cartagena Protocol on Biosafety[22] and its Supplementary Agreement on Liability and Coexistence,[23] and preferential trade agreements such as the TransAtlantic Trade and Investment Partnership (T-TIP) that was being negotiated between the USA and EU are also creating new debates on what coexistence between GM adopting and non-adopting sectors will and should look like.[24] Nevertheless, the impact of organic regimes on these international moves has been relatively ignored.

Although the organic sector's claims for compensation for harm caused by innovation adoption have so far been unsuccessful in the courts, such proceedings add further fuel to the debate. For example, proceedings by an organic farming couple in the Western Australian Supreme Court generated considerable media coverage.[25] The plaintiffs in *Marsh v Baxter* brought torts proceedings against their GM canola growing neighbour after Monsanto Roundup Ready™ canola plant was blown onto the couple's property. The Marshes did not grow canola, there was no physical risk to their crops, livestock or property and negligible risk of GM material fertilising any of their crops.[26] The plaintiffs' unsuccessful claim of economic loss caused by the adventitious presence of GM material nevertheless illustrates two intertwined difficulties raised by organic regulation: (in)tolerance for other production systems and uncertainty about organic farmers' responsibilities in coexistence. The Marshes claimed that their certifier's private organic standards imposed a zero tolerance for GM crops by prohibiting both intentional and adventitious 'contamination' and that the spread of GM canola to their land caused them to breach those standards, resulting in economic loss to them.[27] The judge at first instance found that the third-party certifier had misunderstood its' own rules when it decertified the plaintiffs' land and that the defendant was not liable for any subsequent economic loss. This was confirmed on appeal[28] and the High Court of Australia refused the plaintiffs special leave to appeal to it.[29] Regardless

21 See Stuart Smyth, William Kerr and Peter Phillips, 'Recent Trends in the Scientific Basis of Sanitary and Phytosanitary Trade Rules and Their Potential Impact on Investment' (2011) 12 J World Investment Trade 5; Stuart Smyth, Jose Falck-Zepeda and Karinne Ludlow, 'The Costs of Regulatory Delays on Genetically Modified Crops' (2016) 17 Estey J Intl L Trade Policy 173.

22 The Cartagena Protocol on Biosafety to the Convention on Biological Diversity 2226 UNTS 208.

23 The Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety (not yet in force) Decision BS-V/11.

24 See William Kerr, 'Governance of International Trade in Genetically Modified Organisms: Is Future Global Food Security at Risk?' (2016) 16 Estey J Intl L Trade Policy 60. The election of the US Trump administration has raised questions on the finalisation and final form, if any, of proposed EU–US trade treaty known as T-TIP. Shawn Donnan and Arthur Beesley, 'US Reopens Door to Reviving EU Trade Talks' *Financial Times* (24 April 2017) <https://www.ft.com/content/7996f226-282a-11e7-9ec8-168383da43b7?mhq5j=e1> accessed 10 July 2017.

25 *Marsh v Baxter* [2014] WASC 187. For media coverage see, for example, ABC Television *Australian Story: The Seeds of Wrath Part 1* (2015) <www.abc.net.au/austory/content/2015/s4195192.htm≥ accessed 6 July 2017 and *Part 2* (2015) <www.abc.net.au/austory/content/2015/s4199983.htm> accessed 6 July 2017.

26 *Marsh* (n 25) 216–218. However, following the plaintiffs' failure to collect the material or allow others to do it for them until six months after its arrival, eight volunteer GM canola plants eventually grew on the plaintiffs' land [138], [438] and [669].

27 *Marsh* (n 25) 739.

28 *Marsh v Baxter* [2015] WASCA 169.

29 *Marsh v Baxter* (P44/2015) Results of Special Leave Applications heard 12 February 2016.

of the courts' attitudes though, the media has reported that it is unfair that the livelihoods of organic farmers are endangered through 'no fault' of their own.[30]

Similarly, academic discourse often begins on the assumption that responsibility for coexistence falls solely on innovation adopters. Some suggest without explanation that deference should be given to organic farmers' reasonable determination of organic status and whether a particular innovation is acceptable or not, neglecting the impact of these decisions on coexistence or innovation more generally.[31] These examples reflect the obscurity of non-adopters' regulatory frameworks in innovation policy considerations.

3. GM CROP AND NANOTECHNOLOGY REGULATION

All jurisdictions considered here have regulatory processes that address the safety and environmental impact of GM crops and nanotechnology. But those frameworks do not necessarily address the concerns of organic farmers when others adopt agricultural innovations. The technology involved in such innovations is described in Section 5 but to be clear, the GM crops and nanotechnology applications considered here are those legally released. Different issues arise where a non-approved GM crop, for example, escapes to others' land.

EU and Australian GM crop regulation allows for strict controls on adopters even after the relevant crop has been approved for release into the environment.[32] Possible controls include prohibition on cultivation of GM crops in specific areas, information duties and technical segregation measures such as imposition of buffer zones around GM crops, restrictions on the time of year or place where GM crops are grown, and ongoing monitoring of fields for volunteers or the spread of GM material from the authorised area. Unlike EU and Australian authorities, the US Department of Agriculture (USDA) and Canadian authorities cannot require containment of GM crops after approval.[33]

The jurisdictions also differ in their approach to labelling. GM products do not have to be labelled as such in the US and Canada. In contrast, the EU and Australia require certain GM products to be labelled.[34] All jurisdictions though, closely

30 The New Lawyer, 'Slater & Gordon Takes on GM canola spill case' *Lawyers Weekly* (12 August 2011) < https://www.lawyersweekly.com.au/deals/12626-slater-gordon-takes-on-gm-canola-spill-case> accessed 10 July 2017. See for example, Safe Food Foundation & Institute, 'Steve Marsh: Help This Farmer Stop monsanto's GM Canola' <http://safefoodfoundation.org/what-we-do/help-this-farmer/≥ accessed 10 July 2017; Your organic markets, 'GM Contamination Batte Lines Drawn With Organic Farmers' (30 May 2014) <www.yourorganicmarkets.com.au/monsantos-gmo-crops-hurt-organic-farms-in-australia> accessed 10 July 2017.

31 Kiefer (n 14) 1278.

32 EU: Council Directive 2001/18/EC of 12 March 2001 on the deliberate release of GMOs into the environment [2001] OJ L106/1 and European Parliament and Council Directive 2015/412/EU of 11 March 2015 amending Directive 2001/18/EC as regards the possibility for the Member States to restrict or prohibit the cultivation of GMOs in their territory [2015] OJ L68/1; Australia: Gene Technology Act 2000 (Cth) s 62.

33 US: Thomas Redick, 'Coexistence of Biotech and Non-GMO or Organic Crops' (2014) 19 Drake J Agl Law 39; Canada: Stuart Smyth and Alan McHughen, 'Regulating Innovative Crop Technologies in Canada: the Case of Regulating Genetically Modified Crops' (2008) 6 Plant Biotechnol J 213.

34 EU: Council Regulation 1830/2003/EC of 22 September 2003 concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from

monitor the use of GM free labels. This is significant because, as discussed below, in some cases the organic label is used as a de facto indicator of this characteristic. The US Food and Drug Administration final guidance on voluntary labelling for GM products for example, discourages the use of GM free labels where the statement suggests that a product is safer, more nutritious or otherwise has different attributes because it is not genetically engineered.[35]

As with GM crops, regulatory approaches to nanotechnology vary between jurisdictions. However, all jurisdictions considered here regulate with respect to the safety and environmental impact of agricultural chemicals and have moved to address potential risks posed by nanoscale chemicals.[36]

4. ORGANIC REGULATORY FRAMEWORKS

There is no internationally binding regulation of organic production. The Codex Alimentarius Commission (Codex), the international standards setting body for food products, has developed guidelines for countries developing national organic regimes—the *Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods*—although nations are free to impose different requirements.[37] The Guidelines' purpose is to protect consumers from deceptive trade practices rather than address conflicts between different agricultural production sectors.[38] The transnational organic industry regulator, the International Federation of Organic Agriculture Movements (IFOAM),[39] has also created a framework intended to be the norm for the world's organic producers.[40] It does not define 'organic' but defines 'organic product' as one that has been produced, processed, or handled in compliance with organic standards.[41]

Despite the Codex and IFOAM models, national and supranational regulatory frameworks for organic production vary but all have legislatively established regulatory frameworks, although in Australia this legislation applies only for products for the export market.[42] Australia's domestic organic food industry operates under a

genetically modified organisms [2003] OJ L268/24; Australia: Australia New Zealand Food Authority (ANZFA) Standard 1.2.1—Requirements to have labels or otherwise provide information, *Australia New Zealand Food Standards Code*. See also Standard 1.5.2—Food Produced Using Gene Technology.

35 US, Food and Drug Administration Center for Food Safety and Applied Nutrition, *Guidance for Industry: Voluntary Labeling Indicating Whether Foods Have or Have Not Been Developed from Genetically Engineered Plants; Final Guidance* (2015) <www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm059098.htm> accessed 6 July 2017.

36 See Alin Charrière and Beth Dunning 'Timeline: Policy and Regulation in Canada, Australia, the European Union, the United Kingdom and the United States' (2014) <http://issp.uottawa.ca/sites/issp.uottawa.ca/files/issp2014-nanotechnologytimeline.pdf> accessed 6 July 2017.

37 Codex Alimentarius *FAQS – Questions about specific Codex work. Is Codex promoting genetically-modified food (GM foods) and irradiated food? What about organic or halal foods?* <www.codexalimentarius.org/faqs/specific-codex-work/en/> accessed 6 July 2017. See also CAC/GL 32-1999 (n 10) Foreword [2].

38 CAC/GL 32-1999 (n 10) Foreword [2].

39 IFOAM has 800 affiliates in more than 100 countries. IFOAM website www.ifoam.bio/en/about-us accessed 6 July 2017.

40 International Federation of Organic Agriculture Movements, *The IFOAM Norms for Organic Production and Processing, The IFOAM Standard for Organic Production and Processing* (version 2 2014) 7.

41 ibid 22.

42 EU: Council Regulation 834/2007/EC of 28 June 2007 on Organic Production and Labelling of Organic Products and Repealing Regulation (EEC) No 2092/91 [2007] OJ L189/1. See also Commission

voluntary scheme in the sense that there is no legislative standard that must be met before food can be labelled as organic for sale within the country.[43] As in all jurisdictions though, claims to being organic must be verifiable to protect producers from prosecution.[44] Nevertheless, most Australian organic produce on the domestic market is certified by organic status conferral bodies which have in turn been accredited by the federal government under Australia's export regime.[45]

The jurisdictions considered here also take a process, not product, based approach to organic regulation and use the term organic to refer to a process of production rather than the product of such process. For example, Codex describes 'organic' as a labelling term denoting products produced in accordance with organic production standards and certified by a third party.[46] If production standards are met, agricultural products can be labelled as organic, indicating they were organically produced.[47] However, Canada has recently changed its framework so that it no longer states that it is certifying only the process.[48] The implications of this remain to be seen.

Regulation 889/2008/EC of 5 September 2008 with detailed rules on organic production, labelling and control and Commission Regulation No 1235/2008/EC of 8 December 2008 with detailed rules regarding imports of organic products from third countries [2008] OJ L334/25. US: Organic Foods Production Act of 1990 7 USC ss 6501–6522 (OFPA) and accompanying regulations, the National Organic Program (NOP) 7 USC ss 6501 and the folowing. Canada: *Organic Products Regulations, 2009* made under the Canada Agricultural Products Act (1985, c 20 (4th Supp)) and Government of Canada, *Organic Production Systems - General Principles and Management Standards* (CAN/CGSB-32.310-2015). Australia: Export Control Act 1982 (Cth), Export Control (Organic Produce Certification) Orders 2005 (Cth) and National Standard for Organic and Bio-dynamic Produce (Edition 3.7, 1 September 2016).

43 The Organic Consultative Committee Legislative Working Group, comprising government and industry representatives, is currently reviewing regulation of the export of Australian organic products. That work is in confidence and not publically available but the terms of reference do not include setting a legislative standard for the Australian domestic market www.agriculture.gov.au/export/controlled-goods/organic-bio-dynamic/organic-orders-review#the-administrative-arrangements accessed 11 July 2017.

44 Competition and Consumer Act 2010 (Cth), Australian Consumer Law (schedule to that Act) cl 18. The website of Australia's consumer protection regulator identifies Standard AS 6000-2009, *Organic and Biodynamic Products,* a private standard by Standards Australia, as a reference although any one of a range of standards could apply. The standard is currently under review. See Standards Australia, 'AS 6000: Organic and biodynamic products' (Statement 17 February 2015) <www.standards.org.au/OurOrganisation/News/Documents/Statement%20-%20AS%206000%20Organic%20and%20Biodynamic%20Products%2017%20Feb%202015.pdf> accessed 25 May 2015; Canada: Consumer Packaging and Labelling Act (1985, c 38) s 7, Food and Drugs Act (1985, c F27) s 5 and Organic Products Regulations, 2009 s 24(1); EU: Council Regulation 834/2007/EC (n 43) art 2; US: Organic Foods Production Act of 1990 7 USC s 6519(a).

45 Export Control Act 1982 (Cth). Goods may be declared prescribed goods which can then be controlled as specified in the Act. Pursuant to s 15, it is an offence to apply false trade descriptions to prescribed goods or export prescribed goods with false trade descriptions. The Export Control (Organic Produce Certification) Orders 2005 (Cth) Order 1.03 declares organic produce to be prescribed goods for the Act's purposes and those wanting to export such produce must comply with the Orders.

46 CAC/GL 32-1999 (n 10) Foreword [6]. For Codex development of the GM labelling standard see Anne McKenzie, 'The Process of Developing Labelling Standards for GM Food in the Codex Alimentarius' (2000) 3 Agbioforum 203.

47 EU: Council Regulation 834/2007/EC (n 42) art 2 Definitions. US: USDA Regulations 7 CFR s 205, Subpart A — Definitions. s 205.2 (Terms defined). Canada: Canadian Food Inspection Agency, *Regulating organic Products in Canada,* <inspection.gc.ca/food/organic-products/labelling-and-general-information/regulating-organic-products/eng/1328082717777/1328082783032> accessed 11 July 2017. Australia: National Standard (n 42) standard 2 'organic'.

48 Cf Government of Canada, *Organic Production Systems - General Principles and Management Standards* (CAN/CGSB-32.310-2006) s III p iv with current standards (n 42) s III p iii.

The organic regulatory frameworks begin with a series of general principles around organic production.[49] The exception to this is the USA, where there are no general principles on organic production systems, including regarding attitudes to innovative technology. All frameworks then establish minimum standards and certification requirements that must be met for agricultural produce to be labelled organic.

Minimum standards and certification requirements are an essential requirement given the difficulty for consumers in determining whether organic principles have been used in agricultural production.[50] To further protect consumers, accreditation schemes through which private companies are accredited to certify that those wanting to use organic labels have actually followed the necessary production methods have also been established. In all jurisdictions, except Canada, government assesses and supervises private certification bodies that are then responsible for organic certification of agricultural products of individual farmers.[51] For example, the Australian Department of Agriculture which administers Australia's export regime delegates this role to Approved Certifying Organisations (ACOs). ACOs apply the National Standard as a minimum requirement, but are free to stipulate additional private requirements.[52] In the USA, certifications are conducted by USDA accredited certification agencies[53] and in Canada, the Canadian Food Inspection Agency (CFIA) is responsible for monitoring and enforcing organic regulations. Canada is unusual though, because it devolves responsibility further than other jurisdictions by designating third-party conformity verification bodies that are in turn responsible for recommending for accreditation, and subsequently monitoring, accreditation bodies.[54] The position in the EU is described below.

In all jurisdictions, private organic certification schemes may have standards beyond the federal standard.[55] While this article uses a selection of such standards it has not attempted to catalogue them all. But it is important to note that each jurisdiction has an array of additional private standards adding to the complexity of organic regulation that agricultural innovation governance is asked to accommodate.

49 Frameworks also provide for recognition of organic labelled produce of other jurisdictions. That aspect is not considered here.

50 For difficulties in authentication of organic products, see Yona Sidern, Alain Macquet and Elke Anklam, 'Need for Research to Support Consumer Confidence in the Growing Organic Food Market' (2005) 16 Trends in Food Science and Technology 332, 332.

51 Alessandra Arcuri, 'The Transformation of Organic Regulation: The Ambiguous Effects of Publicization' (2014) Regulation and Governance 7. Organic Standards (n 42) s III, p iv.

52 National Standard (n 42) Introduction, 1. ACOs must issue organic produce certificates if produce is subjected to the ACO's Quality Management (QM) system, complies with the system and it and its preparation satisfies the organic produce importing requirements of the relevant importing country authority. Export Control (Organic Produce Certification) Orders 2005 (Cth) Order 2.02.

53 USDA, *Organic Certification* www.ers.usda.gov/topics/natural-resources-environment/organic-agriculture/organic-certification accessed 11 July 2017. See OFPA 7 USC ss 6514–6516 and USDA Regulations 7 CFR ss 205.500–510 for rules around this.

54 Canada: Organic Products Regulations, 2009 s 3.

55 Beckmann and others (n 17) 373. See for example, the US Non-GMO Project which is a non-profit business consortium using a 0.9% tolerance for US organic and non-GM producers. Redick (n 33) text next to fn 10; Non-GMO Project, 'The "Non-GMO Project Verified" Seal' <www.nongmoproject.org/learn-more/understanding-our-seal/> accessed 6 July 2017. Individual US States may also introduce more restrictive requirements because of their own environmental conditions or the necessity of specific production or handling practices particular to the State or region. USDA Regulations 7 CFR s 205.620(c).

This is perhaps most apparent in the EU. While Council Regulation 834/2007EU establishes a supranational organic regulatory framework, it places responsibility for the creation of accreditation systems on individual EU Member States.[56] In many cases, a Member State's competent authority in turn delegates control of such systems to numerous private control bodies which then introduce their own private standards.[57] The UK's Soil Association, Certisud in France and Germany's Kiwa BCS Öko-Garantie GmbH are examples of such bodies. While EU's organic regulatory regime is examined for the purposes of this article, the Soil Association's standards are used to illustrate the further diversity of responses to innovation that the standards of certification bodies add to a single jurisdiction's organic regulatory regime.

The Soil Association is a private certification or control body approved by the UK's competent authority, the Department for Environment, Food and Rural Affairs.[58] The Soil Association's stance is that while the EU Regulation creates standards, the Association must maintain its own additional standards because it is important 'for the organic movement to own the standards – they are too precious and too important to be left only in the hands of the authorities'.[59] Relevantly to innovation adoption, the Association states that it is important 'to be able to react to new understanding, *technical innovation* or progress in the market, and also to new threats'.[60]

5. DIFFICULTIES FOR INNOVATION ADOPTION CAUSED BY ORGANIC REGULATORY FRAMEWORKS

5.1 Rejecting Innovation to Maintain Organic Objectives

Understanding the motivations of those rejecting particular innovations is fundamental to innovation policy. It is difficult, if not impossible, for innovation governance to facilitate non-adoption without knowing non-adopters' concerns. With regard to agricultural innovation, organic agriculture's objections to innovation are unclear and inconsistent, making it difficult for the regulatory regimes for innovation to respond appropriately.

As noted above, the US organic regulatory framework does not include general principles or objectives. The other frameworks justify rejection of GM and nanotechnology innovation because of incompatibility with organic production principles. For example, the Australian Standard expressly prohibits GM crops and nanotechnology on the basis that they are not compatible with the principles of organic agriculture.[61] Similarly, the EU, Canadian, Codex, IFOAM and UK Soil Association standards rely on the rationale that GM crops are incompatible with organic production principles.

56 Council Regulation 834/2007/EC (n 42). See also Commission Regulation 889/2008/EC and Commission Regulation 1235/2008/EC (n 42).

57 European Commission, Directorate-General for Agriculture and Rural Development, *Working Document of the Commission Services on Official Controls in the Organic Sector* (July 2011) 6. A list of these authorities must be regularly transmitted to the EC < http://ec.europa.eu/agriculture/ofis_public/r8/ctrl_r8.cfm?targetUrl=home&lang=en> accessed 6 July 2017.

58 A subsidiary of the Association, the Soil Association Certification Ltd, actually performs the certification.

59 Soil Association, *Organic Standards – Farming and Growing* (Revision 17.3 Nov 2014) principle 1.5.

60 ibid, principle 1.5 (emphasis added).

61 National Standard (n 42) Scope of this Standard and standard 1.3.

The EU and Canadian frameworks go further and refer to consumer perception as further justification for rejection, the EU Regulation for example, stating that use of GM crops is incompatible with consumers' perception of organic products and that therefore such crops are not to be used in organic farming and processing.[62]

Some regimes raise additional motivations around possible health and environmental risks to justify rejection. For example, the UK Soil Association standards assert that GM crops must not be used because once released into the environment they cannot be recalled[63] and because GM organisms (GMOs) pose potential risks to the environment and human health.[64] The Codex Guidelines provide a further justification on the basis that 'organic principles consider that the use of GMOs deemphasizes biodiversity and is an unnatural addition to the gene pool of cultivated crops, animals and micro-organisms living on farms'.[65] The IFOAM Standard justifies prohibition of both GMOs and nanomaterials on the basis of the precautionary principle and that organic agriculture 'should prevent inappropriate risks by adopting appropriate technologies and rejecting unpredictable ones'.[66] How assessment of predictability is made is not explained. Unlike the other regimes though, Canada tempers any impression of justification on the basis of claims to better human health or safety by making it expressly clear that '[n]either this standard nor organic products in accordance with this standard represent specific claims about the health, safety and nutrition of such organic products'.[67]

The significance of these differences between the regimes is more understandable in the broader context of the GM debate. As Kerr has pointed out, no international regime for trade in the products of biotechnology enjoys widespread support.[68] The EU is the only jurisdiction of those considered here, party to the Cartagena Protocol on Biosafety[69] which is part of the broader framework of the Convention on Biological Diversity[70]; all are members of the World Trade Organisation (WTO) trade agreements including the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS).[71] In brief, while the WTO generally prohibits trade barriers, the SPS Agreement allows countries to adopt or enforce measures even if they restrict trade, if necessary to protect human, animal or plant life or health.[72] The Protocol's scope similarly extends beyond environmental risks to address threats to human health.[73] The regimes differ though in the measures that are acceptable for their purposes. Measures are necessary and therefore consistent with WTO obligations for the purposes of the SPS Agreement, where they are deemed to be such or

62 Council Regulation 834/2007/EC (n 42) Recital 9.
63 Soil Association Standards (n 59) principle 3.6.1.
64 ibid, principle 3.6.1.
65 FAO (n 9) 8–9.
66 IFOAM Norms (n 40) general principle 2.3.
67 CAN/CGSB-32.310-2015 (n 42) s III, p ii.
68 William Kerr 'Governance of International Trade in Genetically Modified Organisms: Is Future Global Food Security at Risk?' (2016) 16 Estey J Intl L and Trade Policy 60.
69 Cartagena Protocol (n 22).
70 Convention on Biological Diversity 1760 UNTS 79.
71 WTO Agreement on the Application of Sanitary and Phytosanitary Measures 1867 UNTS 493.
72 ibid, art 2.
73 Cartagena Protocol (n 22) art 1.

where they meet other requirements. Deemed necessity occurs when a measure conforms to particular international standards, guidelines or recommendations. Such international standards include those of Codex, referred to above. Measures different to such international standards or where there is no international agreement, must be based on scientific principles and a risk assessment that satisfies SPS Agreement requirements to be considered necessary.[74] Whether biosafety regulations for the purposes of the Protocol are consistent with SPS Agreement requirements depends upon the particular regulations. However, two important differences between the regimes should be noted. First, while the Protocol formally recognises the precautionary principle, the SPS Agreement does not.[75] There is some precautionary element in acceptable SPS measures, although the extent of that is not settled.[76] Further, the Protocol permit decision-making on trade in GMOs to include socio-economic considerations beyond those clearly allowed under the SPS Agreement.[77] In particular, considerations not necessarily based on scientific principles are being relied upon for the Protocol's purposes, including ethics and cultural benefits.[78]

Those jurisdictions that have not signed the Protocol are unlikely to have trade regulations (including for organic products) which justify their response to GM crops on the basis of possible threats to human or environmental safety which have not yet satisfied scientific principles referred to in the WTO regime. For example, as discussed in section 5.1, US, Canadian and Australian organic regulations do not refer to responding to possible environmental or human health risks as objectives of organic agriculture. Unsurprisingly, the EU and NGOs on the other hand, which have demonstrated their acceptance of a precautionary approach to decision-making around GMOs, adopt objectives in their organic regulatory frameworks that reflect possible but unproven or unknown risks to human health and the environment.[79]

Consumers are unlikely to have a clear understanding of the message intended by organic labels. The level of potential risk, assessment of that risk and when a risk is worth taking are only some of the matters not explained in the frameworks. Unexplained terms used in some of those frameworks, such as 'unpredictable technologies' and 'unnatural', do not inform consumers, innovation adopters or policymakers what is actually objected to nor enable innovation regulatory regimes to respond appropriately. Looking across multiple jurisdictions only increases that confusion because of the varied explanations. Confusion is further exacerbated by the

74 SPS Agreement (n 71) arts 2.2 and 5.1. See also arts 3.3 and 5.2 and Annex A.4.

75 Cartagena Protocol (n 22) preamble and art 1. With respect to the SPS Agreement, see Appellate Body Report, *EC—Measures Concerning Meat and Meat Products (Hormones)*, WT/DS26/AB/R, WT/DS48/AB/R (16 Jan 1998) (adopted 13 Feb 1998) para 124.

76 Appellate Body Report, *Hormones decision*, ibid.

77 Cartagena Protocol (n 22) art 26 and final preambular reference. See also SPS Agreement (n 71) art 5(3). See further Ludlow and others (n 4).

78 For example, the Norwegian GM legislation expressly includes benefit to the community and sustainable development as factors relevant to biosafety decision-making. Norwegian Gene Technology Act (No 38/1993) s 10. The Philippines biosafety regulation also refers to socio-economic, ethical and cultural benefits and risks. Executive Order No 514, National Biosafety Framework of the Philippines, Principle 2.5 Socio-Economic, Cultural, and Ethical Considerations.

79 Council Regulation 834/2007/EC (n 42) recital 9; IFOAM Norms (n 40) general principle 2.3; Soil Association Standards (n 59) principle 3.6.1

uncertain and open-ended definitions of innovation used by organic regulatory regimes which are discussed next.

5.2 Definitions of Innovative Technology

Innovation governance responses to non-adopters' concerns will be more successful if the definition of that innovation is consistent on both sides of the equation—that is, within the regulation of the innovation concerned and within the regulatory frameworks for non-adopters, in this case for organic agriculture. International trade in agricultural products (innovation adopting or not) is similarly facilitated by consistency in describing those products. However, while definitions in domestic innovation regulatory frameworks move towards global consistency, particularly in the WTO regime described above, this is not the case in organic standards. The open ended nature of those definitions in organic frameworks adds further uncertainty.

5.2.1 Nanotechnology

Nanotechnology involves the manipulation of matter at the atomic or molecular scale.[80] Their small scale means all nanomaterials have a high surface to volume ratio. That increase in relative surface area has significant consequences: it means an increase in the percentage of atoms at the surface and therefore more sites for bonding or reacting with surrounding materials.[81] Therefore, nanomaterials, because of their size and the effect of that size on other properties, can possess different physical, chemical and biological properties compared with their equivalent bulk material.[82] This presents 'new opportunities to increase the performance of traditional products, and to develop unique new products'.[83] In the realm of agricultural chemicals, for example, nanotechnology may modify the behaviour of agrochemicals by increasing the solubility of poorly soluble active ingredients, releasing active ingredients in a slow or targeted manner or protecting the active ingredient against premature degradation.[84]

The EU, USA and Codex organic regulatory frameworks do not expressly address nanotechnology; the frameworks of Canada, Australia, IFOAM and the UK Soil Association do by prohibiting its use, other than naturally occurring nanoparticles.[85]

There is no universally agreed scientific definition of nanotechnology or nanoscale,[86] but in a deliberate move to international consistency the majority of

80 For example, a human hair is about 80,000 nm wide and a sheet of paper about 100,000 nm thick.

81 Tracy Hampton, 'Researchers Size Up Nanotechnology Risks' (2005) 294 J Am Med Assoc 1881, 1881.

82 Council of Canadian Academies, *Small is Different: A Science Perspective on the Regulatory Challenges of the Nanoscale* (Report in Focus. July 2008) 3.

83 Günter Oberdörster and others, 'Principles for characterizing the potential human health effects from exposure to nanomaterials: elements of a screening strategy' (2005) 2 Particle and Fibre Toxicology 8, 10.

84 Australian Government, APVMA Report (n 7), 13.

85 Canada: CAN/CGSB-32.310-2015 (n 42) s 1.4. Australia: National Standard (n 42) standard 5; IFOAM Norms (n 40) requirement 2.3.5; UK Soil Association (n 59) standard 3.6.23 and 3.6.24. Those standards that do not address nanotechnology nevertheless strictly limit the use of synthetic substances, fertilisers and/or chemicals. US policy makes it clear this includes nanotechnology. Miles McEvoy, *Policy Memorandum 15-2 on Nanotechnology* www.ams.usda.gov/sites/default/files/media/NOP-PM-15-2-Nanotechnology.pdf accessed 11 July 2017.

86 Andrew Maynard, 'Don't define nanomaterials' (2011) 475(7354) Nature 31.

international bodies, including the International Organization for Standardization (ISO), OECD and national and regional governments including the USA and EU, define the relevant scale as between 1 and 100 nm.[87] In contrast, the organic frameworks that expressly address nanotechnology define nanotechnology differently to that approach and in a number of different ways. The IFOAM and Australian organic standards consider the nanoscale range to be approximately 1–300 nm, the Soil Association defines it as a mean size of 200 nm or smaller and minimum particle size of 125 nm or smaller[88] while the Canadian standards define the relevant dimensions as between 1 and 100 nm.[89] The Australian organic standards definition is the most simplistic because, unlike the IFOAM and Canadian definitions, there is no linking of particle size to the attainment of additional or different properties as a result of being at that scale.[90]

The Canadian organic standards were updated in 2015 to reflect the growing use of nanotechnology in food processing equipment, work surfaces and food packaging by creating a limited exception to the prohibition on nanotechnology use in such cases.[91] The IFOAM standards on the other hand, expressly prohibit the use of nanomaterials in production and processing, including in packaging and product contact surfaces.[92]

5.2.2 GM innovation

As with nanotechnology, while there is no international scientific agreement on the meaning of GM crops or GMOs there are international moves towards consistency. The Codex Guidelines contain a provisional definition of GMOs and their products as being:

> produced through techniques in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination.[93]

Such techniques include but are not limited to 'recombinant DNA, cell fusion, micro and macro injection, encapsulation, gene deletion and doubling. [GMOs] will not include organisms resulting from techniques such as conjugation, transduction and hybridization.'[94]

87 International Organization for Standardization ISO/TS 80004-1; OECD Working Party on Manufactured Nanomaterials, *Guidance for the Use of OECD Databases on Research into the Safety of Manufactured Nanomaterials* (2008); European Union Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), *Opinion on the Scientific Basis for the Definition of the Term 'Nanomaterial'* (2010).

88 IFOAM Norms (n 40) Definitions 'Nanomaterials'; Australia: National Standard (n 42) Definitions 'nanotechnology'; Soil Association Standards (n 597) principle 1.2 and standard 3.6.24.

89 CAN/CGSB-32.310-2015 (n 42) s 3.38 'nanotechnology'.

90 Australia: National Standard (n 42) Definitions 'nanotechnology'.

91 Canada: CAN/CGSB-32.310-2015 (n 42) s 1.4(a). The definition of nanotechnology remains the same. See s 3.36.

92 IFOAM Norms (n 40) requirement 2.3.5.

93 Codex: CAC/GL 32-1999 (n 10) 2.2 Definitions. This is subject to final agreement by the parties.

94 Codex: CAC/GL 32-1999 (n 10) 2.2 Definitions.

The EU[95] and Canadian[96] definitions are very similar to that of Codex. Unlike its approach to nanotechnology, the UK Soil Association standards do not include a definition of GM and presumably adopt the EU's definition. Under the US regime, prohibited substances, methods and ingredients include 'excluded methods except for vaccines'.[97] Excluded methods in turn are defined as '[a] variety of methods used to genetically modify organisms or influence their growth or development by means that are not possible under natural conditions or processes and are not considered compatible with organic production'. The definition goes on to define such methods as including and excluding the same methods as the Codex definition although tissue culture, IVF and fermentation are also expressly excluded.[98]

The Australian Standards do not consistently use the term GM, instead using other undefined terms—genetic engineering or genetic manipulation. GMOs are defined on the basis of the process used to produce them, similarly to the other jurisdictions, focusing on whether the method of change to the organism's genetic make-up occurs in ways or with results that do not occur in nature or through traditional breeding.[99] However, it is arguable that the definition is not intended to include all modern techniques because some standards refer to genetic engineering (presumably the same as GM) together with other modern techniques such as polyploidy indicating such techniques would not otherwise be included in the definition of GMO.[100]

The mismatch between definitions used by innovation adopters and non-adopters makes it difficult to develop coexistence regimes acceptable to both groups. The open-ended nature of the definitions discussed above adds to that difficulty. In particular, predictions on whether developments in GM or nanotechnology or newer innovations such as synthetic biology will also be prohibited become unreliable. This is exacerbated in the IFOAM and Australian definitions which allow either how the alteration occurred *or* the results of the application of the listed techniques to be considered in determining inclusion within the definition of GM. For example, IFOAM's definition of genetic engineering is:

> A set of techniques from molecular biology (such as recombinant DNA) by which the genetic material of plant, animals, microorganisms, cells and other biological units are *altered in ways or with results* that could not be obtained by methods of natural mating and reproduction or natural recombination.[101]

95 In contrast with the Codex definition, IVF and polyploidy induction are excluded as producing GMOs giving some indication of the intended breadth of the term. EU: Council Regulation 834/2007/EC (n 42) art 2(2). The use of these techniques is expressly prohibited elsewhere in the Regulation (art 5(m) re farming, art 15(1)(c) re aquaculture, art 14(1)(c)(iii) re livestock and art 15(1)(c) re aquaculture). See also defined terms 'produced from GMOs' and 'produced by GMOs' art 2(t), (u) and (v). GMO is given the same process-based definition as used in the EU's regulatory framework for GMOs. EU: Directive 2001/18/EC (n 32).

96 Canada: CAN/CGSB-32.310-2015 (n 42) s 3.27 'genetic engineering'. Section 6.2.2 excludes IVF & polyploidy induction from being genetic engineering but operators are required to use natural methods of reproduction, excluding these techniques in any case.

97 USDA Regulations 7 CFR s 205.105. There are other exceptions not considered here.

98 USDA Regulations 7 CFR s 205.2.

99 Australia: National Standard (n 42) Definitions.

100 For example, ibid, standard 1.24.3.

101 IFOAM Norms (n 40) Section B, 1 Definitions (emphasis added).

Added to the uncertainty around the objections to innovation by organic agriculture, the difficulties in predicting whether and when future improvements in technology and scientific knowledge of its impacts will be accepted by organic agriculture mean assessments of fitness of regulatory regimes for new technologies cannot reliably allow for non-adopters' needs.

5.3 Tolerating the Presence of 'the Other'

Uncertainties around the scope of objections and definitions identified above would be less significant if feasible tolerances for innovation were adopted. For example, as discussed below, all standards considered here strictly prohibit intentional use of GMOs. IFOAM, the Soil Association, Canada and Australia also expressly prohibit the use of nanomaterials. This zero tolerance to the intentional use of innovations contrary to organic principles is understandable and predictable for a labelling term indicating process rather than product characteristics. However, the responses of organic regulatory frameworks to adventitious presence of innovation cause significant difficulty for innovation adoption. There is, as discussed below, significant variation between organic regulatory frameworks on when the term organic can be applied to products which adventitiously contain innovation. None of them address the adventitious presence of nanotechnology so GMO presence is the focus here.

The EU Regulation allows use of the organic label where GMOs are present except where the product is one for which 'it has to be indicated in the labelling or advertising that it contains GMOs, consists of GMOs or is produced from GMOs according to Community provisions'.[102] EU regulation of GM food allows a 0.9% threshold for GM labelling where there is adventitious presence of a GMO approved for EU release. There is zero tolerance for unapproved GMOs.[103] These tolerances therefore apply for organic labelling purposes. The EU Regulation further provides:

> The aim is to have the lowest possible presence of GMOs in organic products. The existing labelling thresholds represent ceilings which are exclusively linked to the adventitious and technically unavoidable presence of GMOs.[104]

EU organic regulation has been under review following an external evaluation in 2013.[105] A post-Brexit approach will also need development in the UK. In June

102 EU: Council Regulation 834/2007/EC (n 42) art 23(3). See also Recital 30.

103 EU: Council Regulation 1830/2003/EC concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms and amending directive 2001/18/EC [2003] OJ L268/24.

104 EU: Council Regulation 834/2007/EC (n 42) Recital 10. For more on technical avoidability, see KPE Lasok QC and Rebecca Haynes (2005) *Advice – In the Matter of Coexistence, Traceability and Labelling of GMOs. Legal Opinion of 21 January* (Commissioned by Friends of the Earth and others 2005) <www.foe.co.uk/resource/briefings/legal_opinion_in_the_matte.pdf> accessed 6 July 2017; Maria Lee, 'The Governance of Coexistence between GMOs and Other Forms of Agriculture: A Purely Economic Issue?' (2008) 20 JEL 193.

105 J Sanders (ed) *Evaluation of the EU Legislation on Organic Farming* (Thünen Institute of Farm Economics 2013) <http://ec.europa.eu/agriculture/evaluation/market-and-income-reports/organic-farming-2013_en.htm> accessed 6 July 2017. See also European Commission, 'Action Plan for the Future of Organic Production in the European Union' COM (2014) 179 final.

2017, the European Parliament reached preliminary agreement on EU reforms, which if endorsed by the Council and Parliament should come into effect from 1 July 2020.[106] Text of the intended reforms is not available and the preliminary agreement lacks detail. Nevertheless, the draft proposal considered by the Parliament proposed replacing individual national schemes with a Union wide one and removing discretion currently left to Member States.[107] The proposal specifically observed that as a matter of principle there should be a prohibition on the use of GMOs and their products.[108] This prohibition is in similar terms to current EU organic regulation.[109] Nanotechnology continued to not be addressed. The proposal also acknowledged that clear tolerances for GMO presence should be set and there should be harmonisation of action to be taken when non-authorised products or substances are detected.[110] Proposed Article 20 concerned the presence of unauthorised products or substances generally (rather than specifically about GMOs), and provided that presence beyond a set level should not be marketed as organic. In contrast, the Parliament rejected stricter EU-wide thresholds for the presence of non-authorised substances in organic products than in conventional products.[111] It is unclear whether this includes GMO presence but this seems likely.

Importantly, the proposal suggested Member States be permitted to grant national payments to compensate organic farmers for the losses they incur due to contamination of agricultural products by non-authorised products or substances which prevent the marketing of those products as organic provided that *farmers have taken all appropriate measures* to prevent the risk of such contamination.[112] Parliament's preliminary agreement does not comment on this but does note that the responsibility and accountability of organic operators should be increased 'by introducing new precautionary measures that they are obliged to take to avoid contamination with prohibited substances throughout the supply chain' and that if contamination occurs as a result of 'negligent behaviour of the operator - for instance by not applying the precautionary measures or by ignoring advices made by competent national authorities and control bodies - the product would lose its organic status and could be marketed only as a conventional one'.[113]

The Soil Association is strongly opposed to proposed 'arbitrary' thresholds because of concern that the suggested thresholds would affect the organic status of products. At present no threshold is provided for in Soil Association standards.[114]

106 Press Release 421/17 *Green Light to New European Rules on Organic Farming* (28 June 2017, EU Press Office, General Secretariat of the Council); Background Paper, *Q&A on the Informal Agreement on Reform of EU Organic Food Rules* (28 June 2017, European Parliament).

107 *Proposal* (n 20) [3.4].

108 ibid, recital 15.

109 ibid, arts 4(e) and 9. EU GM crop regulation is discussed in section 3.

110 ibid, recitals 49 and 50.

111 Background paper (n 106) 6.

112 *Proposal* (n 20) art 20(3) (emphasis added). Member States may also use the instruments of the Common Agricultural Policy to totally or partially cover such losses.

113 Background paper (n 106) 6.

114 Standard 3.6.3 requires organic products to be 'free of contamination from GMOs or their derivatives'. This is because GMOs must not be used in organic farming or food processing (standard 3.6.1 and principle 1.2). Soil Association Standards (n 59).

The Association asserts that its focus is ensuring that 'organic farmers are not punished for environmental contamination which is out of their control'.[115] More relevantly post-Brexit, IFOAM EU, the EU branch of the organic industry's federation, also rejects the proposed changes to EU organic regulation unless certain requested modifications are made.[116] In relation to GM, these modifications are:

> Establishing more effective protection and liability measures at the EU level, protecting operators serving a non-GMO market. Non-GMO food production must continue to be possible in all Member States and regions. Protecting organic farmers' and processors' legal rights not to be subject to any contamination, and ensuring there is liability for compensation where contamination is found remains critical.[117]

There are no suggestions relevant to clarifying what tolerances IFOAM EU will accept or when an organic farmer will be non-compliant. Further, neither the Soil Association nor IFOAM EU address what responsibility organic farmers have in taking measures to avoid contamination. Most importantly, their responses demonstrate a deliberate merging of organic and non-GM labelling messages, in a context where non-GM labelling is actively discouraged or at least monitored by authorities in the relevant jurisdictions.

Organic standards in Australia are the most extreme in this regard, having zero tolerance for GMO presence regardless of how it came about and prohibiting organic label use where it is known that GMOs are present.[118] Both government and parts of the organic industry have recognised that this impacts the feasibility of the current approach of organic standards to innovation. Australian Organic Ltd, the owner of Australia's largest private certifier, has said:

> This is both a policy and regulatory matter that will see involvement and action by the Government, unless the organic industry itself can determine a satisfactory policy that looks after the interests of its own organic farmers while also respecting their neighbours acting within the law and appropriate codes of practice.[119]

Nevertheless, separate applications to introduce a 0.9% threshold for adventitious GMO presence at the farm level by the Western Australian Agriculture Department,[120] Australian Organic Ltd[121] and Australia's largest private certifier,

115 Soil Association, 'Your Chance to Influence EU Organic Regulation' (13 February 2015).

116 IFOAM EU, *Position on the Commission proposal for a new organic regulation. A Roadmap towards sustainable growth of the EU organic sector* (updated version 15 January 2015).

117 ibid, 21.

118 Australia: National Standard (n 42) standard 1.1.9.

119 Australian Organic, *Application to Alter the National Standard for Organic and Bio-dynamic Produce* (26 February 2015) <http://nebula.wsimg.com/87a7a343285f2b121d63872aeee250b3?AccessKeyId=E78D16ADFE0AC05B7E4D&disposition=0&alloworigin=1> accessed 6 July 2017.

120 Catherine McAloon, 'Organic Certifier Rejects Application to Allow GM tolerance' *ABC Rural* (Australia 16 December 2014).

121 OISCC <nebula.wsimg.com/87a7a343285f2b121d63872aeee250b3?AccessKeyId=E78D16ADFE0AC05B7E4D&disposition=0&alloworigin=1> accessed 11 July 2017.

Australian Certified Organic,[122] have all been rejected.[123] One member of the representative body (Organic Industry Standards and Certification Council (OISCC)) that oversees the Australian standard justified these rejections on the basis that the proposed amendments were inconsistent with Codex standards that the member (incorrectly, as explained below) says, state all materials from GMOs are not compatible with the principles of organic production and not accepted.[124] In fact, while Codex prohibits GMO material and products in organic production, it takes a similarly pragmatic approach to adventitious GMO presence to that of the EU.[125] The UN Food and Agriculture Organization (FAO) (joint creator of Codex with the World Health Organization) has noted that '[t]here is the risk that GMOs may enter organic products through cross-pollination. Organic farms can thus only ensure that there has been no intentional use of GMOs in their products'.[126] It concludes that where there is intentional use, non-compliance should lead to non-certification or withdrawal of certification.[127] Presumably, this is not the case for adventitious presence.[128]

Like Codex, IFOAM also does not require organic products to be GM free, stating:

> Organic certification shall not imply it is a "GE-free" certification. Rather it shall be presented as guaranteeing "production without GE/GMOs". As there is no guarantee that organic products are 100% free from any GMO pollution, organic products shall not be marketed as "GE-free", unless there are specific safeguards and certification procedures for that specific product. Organic producers and associations shall actively inform the consumers of this fact to ensure fair marketing claims and to avoid future debates about consumer deception.[129]

Although the use of GMOs by organic farmers is prohibited by the regulatory frameworks of both the USA and Canada, the adventitious presence of GM material at any level or even cross pollination will not cause organic farmers in those jurisdictions to lose accreditation or be unable to label produce as organic. In the USA, such consequences require intentional use of GM material or failure to use reasonable precautions to avoid GM material. Violation of the prohibition on GMO application requires that the application be intentional.[130] Inadvertent application or contact

122 Calla Wahlquist, 'Australian Organic Regulator pushes for GM-tainted Crops to Retain Certification' *The Guardian* (Australia 17 December 2014).

123 See recently amended National Standard (n 42). See further, Wahlquist (n 122).

124 McAloon (n 120).

125 Codex: CAC/GL 32-1999 (n 10) [1.5].

126 FAO (n 9) 8–9.

127 FAO (n 9) 157–158.

128 See for example, Codex: CAC/GL 32-1999 (n 10) Foreword [6]. The Chairman of the Codex Committee on Food Labelling is reported as saying at its October 2014 meeting (in relation to organic aquaculture), that this was an adjustment to industry practice. Scott Tips, 'Roman Horror-Day: Organic Standards Take a Beating At Codex' *GreenMedInfo*, (US, 21 November 2014) <www.greenmedinfo.com/blog/roman-horror-day-organic-standards-take-beating-codex> accessed 6 July 2017.

129 IFOAM 'Position on Genetic Engineering and Genetically Modified Organisms' (2002) 3 <www.abca.com.au/coexistence/wp-content/uploads/2014/02/IFOAM-GE-Position.pdf> accessed 6 July 2017.

130 USDA Regulations 7 CFR s 205.105(e) and s 205.202(b). Land is also to have distinct, defined boundaries and buffer zones to prevent 'the unintended application of a prohibited substance to the crop or

does not prevent products being sold as organic or cause loss of certification provided the farmer implemented reasonable preventative measures.[131] Case law on pesticide drift supports this view[132] as does USDA policy.[133] However, certifying agents are required to annually test a minimum of 5% of their certified operations.[134] When residue testing detects prohibited substances at greater than 5% of the Environmental Protection Agency's tolerance for the specific residue or unavoidable residual environmental contamination, the agricultural products must not be sold or labelled as organically produced.[135] But, as Du notes, 'there is no EPA threshold tolerance level for the finding of an unacceptable amount of GMO residues in organic food'.[136] GMO residue presence does not therefore necessarily compromise organic status although it may trigger investigation into production methods.

The Canadian Standards also prohibit the use of all materials and products produced from genetic engineering, and intentionally manufactured nanotechnology products or nano-processes in the production or handling of organic products.[137] In light of the strict prohibition on the use of GMOs, certification in Canada can be expected to be suspended and or cancelled by the CFIA or certification body if GMOs are intentionally used by organic farmers. However, it seems organic farmers will not lose organic certification or be unable to use the organic label for adventitious presence of GMOs.[138] Canadian standards also expressly warn consumers that organic products are not necessarily GM free.[139]

5.4 Sharing the Solution

In practical terms, technical segregation measures such as buffer zones can be taken by either or both the organic and innovation adopting farmer. But precautions inevitably add to production costs and the smaller the tolerance, the more expensive these precautions are. This is particularly important for smaller farms, whatever production system they use.[140] For example, buffer zones around fields to achieve a 0.9% tolerance for GM presence need to be five times as large as buffers to achieve a 5% tolerance.

Regulatory regimes for innovation and coexistence impose clear responsibilities (and costs) on innovation adopters. Similarly, all organic standards except the Codex Guidelines place some responsibility on organic farmers to share in taking

contact with a prohibited substance applied to adjoining land that is not under organic management'. USDA Regulations 7 CFR s 205.202(c).

131 Redick (n 33) text next to fn 47.

132 Redick (n 33) fn 47. See also Stuart Smyth and others, *Innovation and Liability in Biotechnology. Transnational and Comparative Perspectives* (Edward Elgar 2010) 28.

133 Miles McEvoy, *Policy Memorandum 11-13 on Genetically Modified Organisms* (15 April 2011) 2 <www.ams.usda.gov/sites/default/files/media/OrganicGMOPolicy.pdf> accessed 11 July 2017.

134 USDA Regulations 7 CFR s 205.670.

135 ibid, s 205.671.

136 Dorothy Du, 'Rethinking Risks: Should Socioeconomic and Ethical Considerations be Incorporated into the Regulation of Genetically Modified Crops?' (2012) 26 Harvard J Law Technol 375, 386.

137 CAN/CGSB-32.310-2015 (n 42) s 1.4.

138 FAO (n 9) 160.

139 Canada: CAN/CGSB-32.310-2015 (n 42) s III, p iii.

140 Beckmann and others (n 17) 383.

coexistence measures. Importantly though, as explained below, what that responsibility is, is unclear and also inconsistent within and between jurisdictions.

While it is arguable whether this is something organic regulations should address, it is important because effective coexistence needs responsibilities on both sides of the equation to be clear, even if not equal. For example, the buffer zone used on one side of a fence impacts the size required on the other side. Further and more importantly, the legitimacy of ongoing demands by non-adopters, development of innovation policy more broadly and international agreement on coexistence require certainty around the obligations of adopters and non-adopters. As noted above, for example, it has been proposed that EU Member States be able to compensate organic farmers for contamination provided organic farmers have *taken all appropriate measures* to prevent that.[141] There is no explanation of what appropriate measures are. This uncertainty makes it difficult for innovation governance to impose effective responsibilities on GM farmers to protect organic farmers while respecting innovation adopters' interests.

Where the responsibilities of organic farmers are specified in organic standards, they are inconsistent even within a single jurisdiction. For example, in the UK, the EU Regulation allows organic farmers to rely on product labels or accompanying documentation provided under EU regulations regarding GM traceability and labelling[142] to establish compliance and organic farmers may assume GMOs and GMO products are not present when there is no label or documentation indicating otherwise.[143] Nevertheless, when an operator suspects their products do not comply with organic production rules doubt must be eliminated before processing or packaging. As in all jurisdictions, operators must inform the control body or competent authority.[144] However, if that operator is certified under the UK Soil Association standards, additional responsibilities are imposed on them. Operators must tell the Association if they know of GM crops being grown within six miles so the contamination risk can be assessed and operators instructed what action must be taken.[145] Operators are warned that if contamination occurs, certification may be withdrawn and reinstatement will be decided on a case-by-case basis.[146] Given that genetic testing for contamination has a 0.1% limit of detection[147] suspension under the Soil Association standards can presumably occur at a level less than the 0.9% allowed under the EU Regulation, although that is unclear. It is also unclear how required precautions or length of suspension are to be determined where contamination is threatened or occurs. As with the EU Regulation though, operators are required to stop trading if

141 See (n 112) and accompanying text.

142 EU: Directive 2001/18/EC (n 32), Council Regulation 1829/2003/EC of the European Parliament and the Council of 22 September 2003 on genetically modified food and feed [2003] OJ L268/1 and Council Regulation 1830/2003/EC (n 34).

143 Council Regulation 834/2007/EC (n 42) art 9(2). See also art 9(3).

144 EU Regulation 889/2008/EC (n 42) art 91(1); Australia: National Standards (n 42) standard 3.1.8; Canada: Organic Products Regulations, 2009 s 18; US: USDA Regulations 7 CFR s 205.400(f)(1).

145 Soil Association Standards (n 59) standard 3.6.22. See also standard 3.6.20. Contamination is defined as including 'physical contamination by pollen, seeds or other plant residues' (standard 3.6.20).

146 ibid standard 3.6.4. See also standard 2.3.1.

147 ibid, standard 3.6.16.

they suspect or know a product produced by them or another operator supplied to them does not comply with the standards.[148]

Drawing on the organic federation (IFOAM) standards does not assist in settling the obligations of organic farmers. IFOAM expressly prohibits both deliberate use *and* negligent introduction of GMOs and products derived from them.[149] Organic farmers are required to take all relevant measures to ensure organic soil and products are protected from contamination,[150] requiring monitoring of crops, soil, water and inputs for risks of contamination by prohibited substances and environmental contaminants.[151] But there is no explanation of what negligence is in this context. Importantly, it is unclear whether an organic farmer's failure to meet the Soil Association standards means the organic farmer is negligent for these purposes or whether satisfaction of the EU Regulation's requirements is sufficient.

Looking across jurisdictions adds to the complexity. This is particularly relevant for international negotiations on standard coexistence practices and consumer understanding of labels. Like the EU Regulation, US and Canadian standards require organic farmers to prevent contact with prohibited substances.[152] Organic farmers are to plan and use verifiable management practices and physical barriers to do this.[153] As Watnick observes, the USDA guidance for certifiers specifies that if residues are determined to be as a result of inadequate measures to avoid contact with excluded methods, certifiers must issue a notification of non-compliance and take corrective action to mitigate contamination.[154] Responsibilities imposed on Canadian organic producers to address the risk of unintended contact with prohibited substances include taking measures to minimise the physical movement of land and crops with such substances[155] and if unintended contact is possible to use buffer zones or other features 'sufficient to prevent contamination'.[156] Certification will be suspended if substances used by the farmer are other than those in the Standards or the agricultural product comes into contact with substances other than those set out in the Organic Standards and ultimately cancelled where specified corrective measures aren't, or can't be, taken.[157] However, as with the EU regime the US and Canadian standards lack sufficient detail for innovation adopting farmers to confidently take precautions based on organic farmers' behaviour. The standards' reliance on terms

148 ibid, standard 2.4.3.

149 IFOAM Norms (n 40) requirements 2.3.1 and 2.3.2.

150 ibid, general principle 4.6.

151 ibid, requirement 4.6.1. Specified measures include barriers and buffer zones to avoid potential contamination and limit contaminants in organic products (requirement 4.6.2).

152 US: USDA Regulations 7 CFR s 205.201(a)(5) and s 205.272(a); Canada: CAN/CGSB-32.310-2015 (n 42) s 8.

153 USDA Regulations 7 CFR s 205.201(a)(5) and s 205.272(a). Such practices include buffer zones, testing seed sources for GMO presence, delayed or early planting to create different flowering times for organic and GM crops, cleaning equipment used in non-organic production and cooperative arrangements with neighbours to avoid adjacent planting. Miles McEvoy, *Policy Memorandum* (n 133)

154 Valerie Watnick, 'The Organic Foods Production Act, the Process/Product Distinction, and a Case for More End Product Regulation in the Organic Foods Market' (2014) 32 UCLA J Env Law & Policy 40, text next to fn 204.

155 Canada: CAN/CGSB-32.310-2015 (n 42) s 5.2.1.

156 Ibid, s 5.2.2. There is no definition of contamination.

157 Canada: Organic Products Regulations 2009 s 20.

such as 'adequate' measures (USA) or 'sufficient' precautions (Canada) adds to this problem.[158]

Australia's National Standard imposes the most onerous responsibilities on organic producers despite having a reservation like the Codex Guidelines and Canadian Standards noting that it cannot be guaranteed that organic products are free of non-allowed material or contaminants because they may be subjected to pollution sources beyond the control and/or detection by certified operators.[159] Nevertheless, the Australian standard expressly provides that 'the final product, or any of its ingredients, must not have been subject to treatments involving the use of . . . products subject to genetic manipulation, or nanotechnology'.[160] The use of products comprised of, or derived from, genetic engineering is therefore expressly prohibited.[161] The Australian standards go further than all other jurisdictions by providing that even where contamination with GMOs occurs as a result of factors beyond the operator's control, contaminated product or its by-products cannot be sold as organic.[162] Contamination is not defined but adventitious contamination, a term defined but not explicitly used in the standards, is defined as meaning 'contamination that has come from outside, accidental, or occurring in an unusual place'.[163] Operators are required to address potential contamination risks and this may require implementation of measures including buffer zones from potential contaminants and 'knowing about contaminant risks'.[164]

Not unexpectedly organic standards differ in the obligations imposed on organic farmers, perhaps reflecting societal and cultural differences between jurisdictions. Coexistence strategies could be expected to respond to those differences. However, the lack of detail in the organic regulatory regimes creates difficulties in confidently building coexistence strategies around the needs of organic producers. Guidance on interpretation cannot be taken from industry norms because of the reliance by industry on unexplained terms. For example, whether certifiers' private standards would be included in an assessment of reasonable care by a particular farmer, particularly where those private standards are different to the legislative standards of the jurisdiction as in the UK is unclear.

6. CONCLUSIONS

This article has demonstrated that regulatory frameworks targeting non-innovative activities can raise significant difficulties for innovation governance. An assessment of those regimes should therefore be included as a relevant factor in the development

158 US: McEvoy (n 133) 3; Canada: CAN/CGSB-32.310-2015 (n 42) s 5.2.2.

159 Australia: National Standard (n 40) Scope of this standard.

160 ibid, standard 5.

161 ibid, standard 1.1.5. See also standards 1.7.3, 1.15.1, 1.23.3, 1.24.3, 2.3.4 and 2.5.3.

162 ibid, standard 1.1.9.

163 ibid, Definitions.

164 ibid, standard 1.3.2. See also Department of Agriculture, *Government Administrative Arrangements for Approved Certifying Organisations Managing Inspection and Certification Programs for the Export of Certified Australian Organic and Biodynamic Produce* (Australian Government, Issue 2 May 2014) [14.2.8] and [14.2.10].

of future innovation governance. Four lessons for use in such assessment can be drawn from the example of agricultural innovation.

First, the needs of the non-innovative activity must be understood. The activity's regulatory regime is an important part of this. In the case of organic production, a diverse range of additional standards are incorporated into each jurisdiction's regime which challenges such understanding.[165] Inconsistent tolerances for adventitious GM presence illustrates how this occurs. Looking *across* jurisdictions, while inadvertent GM presence does not impact organic labelling in the USA and Canada, it does so in Australia at any level. In contrast and adding to the confusion, the EU allows up to 0.9% of inadvertently present GM material without loss of organic labelling rights. Looking *within* jurisdictional frameworks, while the UK as part of the EU tolerates 0.9% GM presence, at least one UK certifier (the Soil Association) has demanded that there be no tolerance threshold. It is unclear whether this means the Association wants a threshold of 0% or whether it does not want a threshold at all, provided any GM material is present adventitiously, but the point is that it is different to the tolerance of the EU Regulation. One of the most important demands of coexistence strategies is respect for organic production's tolerance but as illustrated above, knowing what that tolerance is, is difficult. Interestingly and in contrast with the approach to GM crops, none of the standards address the adventitious presence of nanotechnology, even those that prohibit its intentional use. No explanation for this difference in approach to the two innovations is given by any framework, but it arguably highlights the arbitrariness and unpredictability of these requirements.

While diversity can be a positive, the diversity of standards as between individual certifiers within a single jurisdiction as well as looking across different jurisdictions challenges innovation governance. Effective coexistence measures will require either bespoke development to respond to the needs of each producer, or will need to respond to the strictest of possible standards. Some may see these as acceptable solutions but the point here is that demanding innovation governance respond to the requirements of what are essentially private standards may effectively defeat national policies of allowing innovation adoption. Policymakers may be comfortable with this, but that outcome should be an informed, intentional decision rather than a hidden obstacle to innovation adoption. Inconsistencies *between* national organic regulatory frameworks may also drive innovation research and development and subsequent economic benefits to other countries particularly if other countries do not impose the same standards.[166] Inconsistencies also negatively impact the organic industry itself and consumers. For example, there have been reports of products that fail to meet organic requirements in some EU countries being shipped to other EU countries where they can still be marketed as organic. Organic supporters have described this as fraud on consumers.[167]

165 Organic farmers can also privately contract with the marketplace to meet additional standards but these are not included in a jurisdiction's legislative framework.

166 Gemma Masip and others, 'Paradoxical EU Agricultural Policies on Genetically Engineered Crops' (2013) 18 Trends in Plant Science 312, 313.

167 US Sustainability, 'EU Planning Pesticide Thresholds for Organic Food' (13 October 2016) <http://thesustainabilityalliance.us/pesticide-levels-organic-food/> accessed 28 November 2016.

A second lesson relevant to assessment of non-innovative activity regulation when creating innovation governance is around the regime's attitude to future innovation. Such regulations may make it difficult to predict which future technological changes will require governance measures. In the case of organic regulation, lack of clarity in objections to innovation and innovation definition create this obstacle. The early responses to nanotechnology, including differences in the definition of nanotechnology, demonstrate the diversity of responses organic regulatory frameworks can take to one innovation. Regimes that share these difficulties may discourage development and adoption of newer and as yet unknown innovations because non-adopters' responses cannot be accurately predicted, in turn negatively impacting research and development into future innovation.[168]

Thirdly, regulation targeting non-innovative activities may create consumer confusion despite innovation governance attempts to prevent that. For example, GM regulatory regimes address GM labelling. However, organic regulatory frameworks may allow organic labels to be used as de facto GM-free certifications.[169] Only the UK Soil Association and Canadian Organic Standards expressly address consumer understanding of the labelling term 'organic'. The approach of the Canadian Organic Standards and the organic federation's (IFOAM) benchmark regarding prevention of consumer deception provide examples of steps to begin to solve this problem. They expressly explain that organic practices cannot assure that organic products are entirely free of prohibited substances, but that permitted practices are designed to assure the least possible residues at the lowest possible levels. The approach to labelling following adventitious presence is consistent with that in all jurisdictions, except Australia where organic labelling cannot be used in such cases. A zero tolerance for adventitious presence is not appropriate where the terms organic and organic production are defined on the basis of an approach to production, rather than the characteristics of the final product. Inconsistencies in GM tolerances *within* a jurisdiction increases consumer confusion. Uncertainty around organic agriculture's reasons for rejecting innovation should also be addressed to properly solve this problem.

Problems caused by lack of clarity around the responsibilities of non-adopters is the fourth lesson for assessment of innovation governance. In the agricultural context, the behaviour of organic farmers inevitably shapes the precautions that must be taken by innovation adopters to avoid unfairly impacting organic production. However, lack of detail around organic farmers' responsibilities creates significant uncertainty around the measures that innovation adopting farmers must take to protect the organic sector's interests. Lack of clarity around the obligations that will be

168 Smyth and others (n 21).

169 Toomey suggests such problems should be addressed by a legislative definition of organic products that includes the ingredients and condition of the final products. She goes on to suggest this definition would define organic products in part as products free from all detectable levels of GMOs and have to be inspected to ensure this. Erin Toomey, 'How Organic is Organic? Do the USDA's Organic Food Production Act and National Organic Program Regulations Need an Overhaul?' (2014) Drake J Agric L 127, 145.

imposed on innovation adopters may slow the uptake of innovation, in turn challenging innovation policy more broadly.[170]

The challenges identified above mean that there is still some way to go before organic and innovation adopting agricultural production sectors can be said to be successfully growing together. For future innovations, failure to consider the lessons drawn from those challenges in policymaking and governance creation may have even more serious repercussions.

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170 Lack of detail on organic farmers' conduct that results in loss of certification reflects the ongoing debate about the objectives of organic regulation—whether it is for biological rehabilitation, management assessment and/or prevention of short-term opportunists through a market barrier. FAO (n 9) 113.