THE QUANDARY OF AGRICULTURAL BIOTECHNOLOGY, PURE ECONOMIC LOSS, AND NON-ADOPTERS: COMPARING AUSTRALIA, CANADA, AND THE UNITED STATES

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Innovations impact societies in a variety of ways. Successful innovations are utility enhancing, in that they create a higher degree of benefits that offset any of the potential disadvantages of the innovation. Unsuccessful innovations suffer from the reverse, in that they result in more disadvantages than benefits and therefore, are ultimately rejected by society. The innovation of agricultural biotechnology and genetically modified (GM) crops has triggered substantial discussion regarding the advantages and disadvantages of the technology. Numerous financial and economic benefits are starting to be recognized by adopters, but some non-adopters are growing increasingly concerned about their ability to profit given the high levels of GM crop adoption. While some might argue that non-adopters of GM crops are the conventional economic losers of this innovation, the reality is that demand for non-GM products is higher, in large part, because of consumer desires to avoid GM food products. The concept of pure economic loss in relation to innovation posits that those negatively impacted by the innovation of GM crops are entitled to compensation that offsets the externality. In undertaking a thorough assessment of pure economic loss and GM crops, this article evaluates the logic for, and efficiencies of, having compensation funded via the use of courts versus government regulations. This article considers whether non-adopter rights are developing in the case of GM crops and what governance response mechanism is best suited to those claims. It is concluded that the decision over whether to support or reject an innovation is too important to the larger society as a whole to be decided by the courts.

Innovation presents governments and society with a quandary. Supporting innovative research is seen as a beneficial investment governments can make for society as a whole. In fact, numerous international agencies collect data and report on how much investment, as a percentage of gross domestic product, is made in research and development by governments around the world. When innovative research results, however, in a transformative technological advancement, such as biotechnology, its entry into the marketplace inevitably creates winners and losers.

The advent of agricultural biotechnology in the form of genetically modified (GM) crops acutely shows how the form of legal categories used to regulate an innovation very heavily influences the outcome of the decision to introduce the innovation or not. The government's support of the innovation of GM crops by allowing the introduction of such crops has precipitated demands for protection and even compensation by non-adopters: the rise of what could be called non-adopter

rights. That is, instead of accepting societal changes created by the innovation and seeking ways to market their product as unique, superior, or different, and accepting the cost of this market differentiation, non-adopters are seeking compensation for extra costs and loss of markets.1 In a market economy there is always a risk of these things happening and the issue for society is under what, if any, circumstances should the non-adopter be relieved of the economic risk and the innovation adopter made to bear it?2

Importantly, and perhaps more controversially, non-adopters are also seeking protection and compensation because in some cases they can no longer choose to be non-adopters at all. For example, a buyer, or even an entire market, may decide not to buy a farmer's crop even though it suffered no actual contamination by an unapproved GM crop nor comingling with an ap- proved GM crop. Alternatively, a non-adopter may be unable to pursue their preferred method of farming, such as organic farming, or will need to change agricultural practices or incur additional costs because of the release of GM crops in their region.3 These types of harms are known as pure economic loss-"an adverse impact on the plaintiff's financial position" because of a change in the value of the plaintiff's assets or reduced profitability of the plaintiff's economic activities, or both.4 Agricultural biotechnology is causing, possibly for the first time in agriculture, this expanded conception of the rights of non-adopters to be expressed and in some cases recognized. Society must consider whether harms such as the loss of opportunity to farm in the manner of the non-adopter's choosing should be compensable in the context of agricultural biotechnology. On one side of the debate, the Organic Federation of Australia (OFA) has stated that the right to be "GM-free" is "fundamental" and must be preserved because it goes to the heart of the responsibility that farmers have to ensure that their actions do not impact others.5 Industry, on the other hand, has said:

The concept of freedom to farm needs to be given appropriate consideration. We pose the rhetorical question; how far do the rights of organic growers extend before they are able to restrict the ability and freedom of adjacent farmers to make their own decisions in respect of growing non-GM and GM crops in a district.6

Some countries have responded to non-adopters' claims by outright banning of the technology (for example, France, Austria, and Italy); others have tried to use international trade agreements to prohibit the import of products derived by genetic modification (for example, the European Union). But other countries have openly embraced the technology and promoted its adoption (for example, Canada and the United States). Canada, the United States, and Australia all allow GM crops to be released into the open environment. This is despite knowing that the spread of GM organisms (GMOs) to other agricultural premises or postharvested material is possible or even likely.7 More rele- vantly for this paper, even if there is no actual contamination or comingling, loss or cost to non-adopters is still possible.8

Canada and the United States are two of the world's five largest adopters of GM crops,9 with our expectation that Australia will move quickly into the top 10 now that GM canola has been approved. In all three jurisdictions, compensation for harms caused by GM crops is a matter for the courts.10 There is no provision for compensation under the relevant national regulatory schemes.11 On the other hand, those commercializing GMOs, even in compliance with all relevant regulations, are not given statutory immunity where they nevertheless cause harm to others. The relevant governments clearly intend liability for harm arising from GMO releases be determined by common law principles.12

The role of the court is less about restricting or preventing the commercialization of new innovative products than it is about dealing with the marketplace impacts following commercialization. Of course, courts can be and have been used to seek injunctions against a specific event (for example, construction of a new dam or building) and to prohibit the use of unsafe products, but it is without precedence for a court to outright ban an innovation before its commercial release into a society where environmental and health concerns do not exist. An injunction against GM wheat was sought by Saskatchewan organic farmers as part of a Canadian class action lawsuit against Aventis and Monsanto for commercializing canola, but was dropped prior to a decision of the court.13 It is uncertain whether the choice of non-GM agriculture will be treated preferentially by the common law. But it is clear that the courts of all three jurisdictions do not want to unduly interfere with the legitimate pursuit of personal gain, such that commentators have suggested that "tort law reflects what might be called 'commercial morality.'"14 How the courts balance one person's desire not to adopt a transformative innovation, such as GMOs, against another's desire to adopt that innovation, such as by farming GMOs, is an issue relevant to any transformative innovation.

In addition to the courts, other innovation-response mechanisms could be used in protecting non-adopters' rights. The most important of these is arguably regulations managing or controlling innovations once they have entered the marketplace. The commercialization of innovative GM crop technologies has resulted in jurisdictions using a variety of regulatory mechanisms to manage the technology and respond to non-adopters' claims. As with the common law, the adequacy of state responses in balancing the rights of adopters with non-adopters is crucial to the successful introduction of innovations.

The intention of this article is not to discuss or assess the risks or benefits of GM crops. That work has been done elsewhere. Instead, this article considers whether non-adopter rights are developing in the case of GM crops and whether the common law and state response mechanisms are best suited to those claims. The examination will be undertaken through the lens of liability for pure economic loss-the most contentious of non-adopters' claims-and considers those claims in the United States, Canada and Australia where GM crops are being widely adopted. The article begins

in Part I by considering the attitude of the courts in those jurisdictions to such claims. It does this by examining the common law liability in negligence for both GM adopting farmers that plant and harvest GM crops (GM adopters) and those creating and distributing GM seeds (GM developers) toward non-GM farmers. The potential liability of regulators and the liability of GM adopters and developers to each other are not considered. Although the issues of breach of duty and causation of harm raise particularly difficult problems in claims of negligently caused pure economic loss, this article considers only whether a duty of care will be owed.15 This focus has been chosen because the legal concerns taken into account by courts in the duty analysis can be expected to reflect the jurisdiction's concerns and values in the context of innovation. As Stapleton writes in relation to pure economic loss cases in, amongst others, Australian and Canadian courts: "[C]ourts now tend to use an open-textured analysis of all the substantive legal concerns weighing for and against recognition of a duty, be they moral, economic, or other types of concerns relevant to the incidence of tort liability."16

As explained below, whether a duty is owed depends in part on "a value judgment based on the judiciary's view of community expectations as to the appropriate range of protection to be afforded in respect of the growing of crops."17 It is those "values" or normative judicial concerns and how they will play out in scenarios involving non-adopters' claims in the three different countries that is of interest in this paper.

Part II of the article then examines the state response to non-adopters' rights. This will be particularly important during the usual time lag between the commercialization of an innovation and the availability of insurance for harm caused by that innovation. The economic rationale for having the state compensate non-adopters for economic loss incurred as a result of widespread adoption of GM crop technology is also considered. The authors argue that governments are not efficient allocators of compensation. It is not intended to argue that the courts of these jurisdictions use economic theory to reach their decisions.18

Finally, the authors will try to draw conclusions about the adequacy of responses of courts and regulators.19 It will be concluded that because responses by the courts and regulators to non-adopters' claims are unsatisfactory in some aspects, action by governments at the international level may improve the situation but not solve the quandary altogether.

I. ECONOMIC LOSS AND THE COURTS

A. Negligence Causing Pure Economic Loss

The relationship between tort law and new economic interests is an uneasy one. As noted by two Canadian commentators:

. . . as new markets are created, new technologies developed, and new conflicts of competing economic interests occur, the courts have had to create new causes of action, to modify or even stifle old ones. In each case the judge or judges concerned bring their experience and judicial values to bear on the "socially proper" outcome to adopt. In each case the courts regulate market behaviour, utilizing doctrinal devices such as "unreasonableness" in negligence . . .20

The law of negligence in all three jurisdictions was originally derived from the United Kingdom. However, differences in the development of the law, in particular the treatment of recovery for pure economic loss caused by negligence, gives rise to differences in the precise legal rules.21 These arguably reflect, to some extent, different societal values in the jurisdictions. A major difficulty for innovative products such as GMOs is predicting whether their use will be regarded as falling below societal standards and whether the claims of harm they cause will be considered actionable by courts. This perhaps reflects the relevant society's predisposition to innovation more generally. At the least, it sends a message to future innovators on possible obstacles to commercialization.

In each of Canada, Australia, and the United States, establishing a duty of care in respect to pure economic loss requires that damage to the plaintiffbe reasonably foreseeable. However, because of concerns about the effect of liability in such cases, something more is required. A duty of care is not im- posed merely because a person knows that their act may cause economic loss to another.22

A negligence action claiming pure economic loss caused by the release of GM crops is least likely to be successful in the United States because of the pure economic loss doctrine, which bars recovery of pure economic loss in certain negligence cases.23 The rationale for this doctrine is to "[avoid] the imposition of extensive and indeterminate liability,"24 such liability potentially imposing "ruinous consequences on socially useful activity."25

In Canada, pure economic loss cases are generally organized into one of five recognized categories of claims,26 the most relevant here being relational economic loss. Relational economic loss is loss suffered by the plaintiffbecause the defendant's negligence damages a third party's property. For example, if the defendant did indeed contaminate some farmers' crops, then other farmers may suffer harm because they are no longer able to sell their crops to their intended markets at all or at the price they expected. Of course, this result could occur even without actual contamination of or comingling with any crop-merely the threat of such things may be enough to have market repercussions. In the latter case, there would be no damage to a third party's property and, therefore, there would be no relational economic loss.27

Novel Canadian cases not falling into one of the recognized groups require the application of a three-part test. In addition to reasonable foreseeability, the plaintiffmust establish proximity

between himself and the defendant, demonstrating "that the defendant was in a close and direct relationship [with the plaintiff] such that it is just to impose a duty of care."28 Policy considerations arising from the relationship between the parties form part of this proximity analysis.29 Finally, the court considers whether there exist any residual policy considerations justifying denial of liability.30 These include "the effect of recognizing that duty of care on other legal obligations, its impact on the legal system and . . . the effect of imposing liability on society in general," 31 and the fear of indeterminate liability.32

Australian courts also place heavy emphasis on policy considerations in determining whether there is a duty of care, even when the reasonable foreseeability requirement is satisfied. It is generally agreed that the additional duty requirement involves consideration of the relevant policy or factual considerations, or "salient features,"33 "of the particular category of negligence, which bear on the question of duty of care."34 Factors for or against the duty of care must be considered.35 In essence, liability is imposed "in situations where it is reasonable to require a person, in the position of the alleged wrongdoer and in the circumstances of the alleged wrongdoing, to be liable for the particular kind of injury suffered as a result of the alleged wrongdoing."36 The Australian High Court considers the following factors as relevant in cases of pure economic loss caused by a negligent act: indeterminacy; unreasonable interference with personal autonomy, economic freedom and market competition; control by the defendant over the plaintiff's legal rights; vulnerability of the plaintiffand reliance by the plaintiffand the undertaking of responsibility by the defendant; and the existing statutory regime and common law regulating the relevant act.37

A significant difficulty in predicting the outcome of any particular proceeding is that the decision about what factors are important in any particular case is subjective.38 Nevertheless, the factors described above include those factors used by U.S. courts to justify the imposition of or departure from the economic loss doctrine as well as those factors assessed by the Canadian courts in their three part test. These factors will therefore be considered in more detail below in the context of GM crops following a brief description of relevant case law in each jurisdiction. The arguments for and against each factor being used will be canvassed and conclusions then drawn together in the final section of this part. Whether the predicted findings are economically sensible is considered in the final part of this article, after consideration of regulatory alternatives to reliance on the common law to address non-adopters' rights.

1. United States

a. GM Case Law

The U.S. Department of Agriculture (USDA) regulates importation, movement and field testing of plants to protect against pest crops. Its current regulations (like those in Canada) mean there is arguably no obligation on GM adopters or developers to contain approved GM crops, and it is the

responsibility of non-adopters to take precautions to avoid harm.39 This is in contrast to Australian regulations where responsibilities are often imposed on GM adopters and developers to contain approved GMOs.40 There are U.S. regulations, however, forbidding the escape of GM crops unapproved for commercial production that are undergoing field trials.41 U.S. (and Canadian and Australian) regulations can also be relevant to GM food crops. For example, in the U.S. case of In re StarLink Corn Products Liability Litigation (StarLink Litigation), 42 GM corn approved only for sale as animal feed and ethanol production entered the human food chain.43 Contaminated corn products, such as taco shells, were then withdrawn from sale. Many companies, including grain handlers, farmers, food processors and retailers then successfully looked to the developer-patent owner, Aventis CropScience (now Bayer CropScience), for compensation.44 However, in StarLink Litigation, the plaintiffs' property had been contaminated by the defendant's GM crop. That litigation did not con- sider the situation where there has been no actual contamination or comingling, but nevertheless there is a loss of market access or inability to continue to farm in the way the plaintiffhad previously done because of the need to take (often expensive) precautions against GM contamination. That is the issue for this article.

b. Pure Economic Loss

In Sample v. Monsanto Co. growers of non-GM soybeans and corn brought a class action against GM seed developers-Monsanto Company, Pioneer Hi-Bred International, Inc., and Syngenta, Inc.- for, inter alia, negligence. 45 Claims of property damage were abandoned.46 Instead, it was alleged that the commercial release of GM crops in the United States caused the plaintiffs' loss of markets because of concerns about comingling of non-GM crops with GM crops in marketing channels.47 The Court applied the "pure economic loss doctrine" to dismiss the claim.48

As noted above, the pure economic loss doctrine bars recovery of pure economic loss in a variety of situations "if there is no personal injury or physical damage to property other than the property at issue in the case."49 This rule constrains the foreseeability requirement and thus avoids imposing extensive and indeterminate liability on the defendant.50 However, individual U.S. states have different rules in relation to the doctrine's application. For example, the court in In re Genetically Modified Rice Litigation noted that under Missouri law common law tort claims are not barred by the economic loss doctrine.51 Furthermore, although Missouri does not allow any tort claims arising from a breach of a contractual duty, Missouri courts have rejected the doctrine despite the existence of a contractual relationship, but only if the particular duty alleged to have been breached arose from the common law and not from the contract.52 Further, the doctrine did not apply if, as was the case there, the plaintiffs were claiming damage to other property besides the defective property itself .53

Benson, an American commentator, argues that the basis of the economic loss doctrine is a right-based one.54 He asserts that the imposition of a duty requires both foreseeable harm and misfeasance in the sense that the defendant has interfered with something that comes under the plaintiff's exclusive rights as against the defendant.55 The usual requirement of a proprietary or possessory interest in the damaged property is therefore only one way to show exclusive rights, albeit a common one. Where non-adopters claim to have lost potential markets or the opportunity to farm as they wish because of the introduction of GM crops then, pursuant to Benson's argument, there is arguably no exclusive rights that have been injured.56

2. Canada

a. GM Case Law

In Hoffman v. Monsanto Canada Inc,57 the Saskatchewan Court of Appeal confirmed that developers of GM canola approved under federal law were not under a duty of care to farmers who claimed economic loss through the loss of the European market for organic canola, loss of the practical option to choose to grow organic canola, or for removal of volunteer GM canola growing on the plaintifffarmers' land.58 The court reasoned that there was insufficient relational proximity between the parties and there were also policy reasons to negate such a duty.59 Burns and Blom cite this decision as an example of the prospect of indeterminate liability inhibiting the recognition of a duty where there is no contract or series of contracts in which both parties participated.60 They assert the indeterminacy lies in the "fact that the defendant would be exposed to a liability, the extent of which would be difficult for the defendant to gauge and the risk of which would be difficult or impossible for the defendant to circumscribe."61 The Court itself said that the government approval of the unconfined release of the GMO provided a powerful policy reason for negating any duty of care.62

b. Pure Economic Loss

As noted above, so called contractual relational economic loss cases, where the plaintiffhas a contractual relationship with the third person whose property was damaged or interfered with by the defendant are unlikely to be successful. In Bow Valley Husky (Bermuda) Ltd v. Saint John Shipbuilding Ltd., the Canadian Supreme Court found that while economic loss was reasonably foreseeable on the facts, the prospect of indeterminate liability meant that there was no duty.63 The Court found that there was nothing to distinguish the two plaintiffs from others whose business depended on the damaged property. 64 Confining plaintiffs to users of the damaged property was rejected as a way to overcome indeterminacy on the basis that it was arbitrary and without legal or social justification.65 Further, the Court found that other policy concerns pointed to no duty as well: imposing a duty would not enhance deterrence of negligent conduct (because the owner of the damaged property could already sue the defendant), and the plaintiffs were not

vulnerable and could have allocated the risk by contract with the third party, which the plaintiffs in fact owned.66

Non-adopters' pure economic loss claims are likely to arise where the plaintiff(s) do not have a contractual relationship with the third party but were nevertheless dependant on the characteristics of a third party's property in some way. Such claims are likely to raise even greater indeterminacy concerns and so a duty is even less likely to arise in such cases. However, in Sauer v. Canada (Attorney General), a class action on behalf of Canadian commercial cattle farmers for losses suffered when Canadian beef exports were stopped because of a single case of "mad cow disease" allegedly caused by the animal eating the defendant's feed,67 the Ontario Court of Appeal upheld the motion judge's refusal to strike out a claim of negligence.68 The Court said the decision in Hoffman was of little assistance because it was made in the context of the test for certification of a class action.69 Indeterminacy was, it seems, not of such concern in this case where the parties were "part of one integrated industry, from the supply of feed through to the sale of cattle."70 In addition to this economic link, a regulatory link existed because feed is "regulated nationally in the interests of the participants in it and the public."71 Such an approach could also be taken by the courts with GM crops.

3. Australia

a. GM Case Law

In Australia, research and development, field trialling and commercial growing of GM crops is regulated by a federal authority: the Gene Technology Regulator.72 Some Australian States also have legislation regulating the release of certain GMOs including some GM crops. There have been no decided cases concerning agricultural GMOs in Australia.

b. Pure Economic Loss

There is one particularly relevant High Court case concerning claims resulting from agricultural contamination. In Perre v. Apand Pty Ltd., a South Australian farm owned by the Sparnons was contaminated by a potato disease following the supply of infected seed potatoes to the Sparnons by the respondent. 73 The importation of the infected seed potatoes into Southern Australia by the respondent was illegal. The disease caused physical damage to the Sparnons' potatoes for which they were compensated. The Sparnons therefore suffered property damage because their tangible property, the potatoes, was damaged by the disease introduced by the respondents. The Sparnons also suffered consequential economic loss, such as lost profits they would otherwise have received upon the sale of vegetables grown on their property and the costs of eliminating the disease from their land. The Full Court of the Australian Federal Court found the respondent liable in negligence

to the Sparnons for all such damage. The respondent did not appeal to the High Court from that decision.

The Perres were a group of potato producers on properties between 2 to 3 kms around the Sparnons' farm.74 Some of the producers grew potatoes while others only processed and packed them.75 The disease did not spread to their properties and they had no contractual relationship with the respondent. However, their businesses were affected by the damage to the Sparnons' property. Most of the Perres' potatoes were sold in Western Australia where potatoes sold for much more money than they did in South Australia. Upon the outbreak of the disease on the Sparnons' property, the Perres lost their export market. Regulations in Western Australia prohibited the sale of potatoes in that State if grown on a property, or processed with other potatoes grown within 20 km. of a property, infected with bacterial during the previous five years.76 Because of those regulations, the entire region in which the Sparnons lived lost its export-approved status despite the fact that the disease did not spread beyond the Sparnons' property.77 Landowners also claimed that the value of their land had been reduced because it could not be used for growing potatoes for the Western Australia market.78

The Australian High Court unanimously held that the loss suffered by the Perres was pure economic loss.79 Such economic loss was caused by the respondent's damage to a third party's, the Sparnons, property. Two of the judges found that certain members of the Perres group were one step further removed from the property damage suffered by the Sparnons than other Perres group members. Although all seven judges found that those members of the Perres group who grew potatoes succeeded in negligence, only five found that those who processed and packed the potatoes could succeed.80 The reasons for the decision are discussed in the next sections.

B. Relevant Legal Concerns

1. Indeterminate Liability

In all three jurisdictions the avoidance of indeterminate liability is a primary concern in pure economic loss cases.81 It is this concern that makes it unlikely a duty would be found in the United States. Liability is indeterminate when the likely number of claims and the nature of them cannot be realistically calculated.82 In Australia at least, for liability to be determinate the defendants need not know of individual persons; liability can be determinate when at the time of the negligence the tortfeasor could have ascertained the identity of the specific class of persons likely to be affected.83 This also seems to be the case in Canada.84 Stapleton has explained that the courts in both jurisdictions are seeking boundaries based on normatively justifiable arguments.85

In the case of GMOs, GM adopters and developers would or should be aware of the existence of particular markets for non-GMOs and GM developers would or should be aware of regulatory obligations imposed on those growing GMOs. In the words of the Sauer court, there is perhaps an economic and, at least in Australia, where the production of GM crops after approval is regulated, a regulatory link between GM adopters-developers and non-adopters. Further, the number of non-adopters who may be affected is arguably finite and ascertainable (although possibly large).86 Indeterminacy in respect to those who have directly and primarily suffered harm should therefore not be a basis on which a court refuses to find a duty of care.87

Indeterminacy will mean, however, that no duty of care is likely to be owed to second line or ripple effect victims in all three jurisdictions.88 Such victims would, for example, be persons who handle the produce of nonadopters. 89 As a general rule, those who suffer loss as a consequence of the primary or first line victim suffering loss (that is, the person who has directly suffered harm) are not owed any duty of care to avoid pure economic loss.90

Similarly, second line victims would be an unascertainable class in the case of GMO releases because it would be impossible to say how many are likely to be in the class. GM adopters-developers could not realistically calculate the numbers affected or, if required, the quantum of claims as at the time of the release.

Regulations put in place by state or national governments may have a significant role to play in determining whether indeterminacy is a relevant concern in Australia and Canada.91 For example, in a case concerning the contamination of cattle by an insecticide used in growing cotton after cattle grazed on cotton stubble, the Australian Federal Court refused to recognize a duty of care to, amongst others, exporters who lost business or profit because of the effect of controls introduced by foreign governments.92 In Perre, the economic loss flowed from state regulations but it was not where the line regarding indeterminacy was drawn-some who suffered loss because of the regulation were allowed to recover, others were not. Therefore, in the case of GM crops the line may not be drawn on the basis of whether the crop is legally approved in the particular country or not.

2. Unreasonable Interference with Personal Autonomy, Economic Freedom, and Market Competition

Reluctance to interfere with personal autonomy, competitive commercial practice, and with the right to legitimately pursue personal gain in business is another primary concern of the courts in all three jurisdictions in pure economic loss claims.93 The courts are "[reluctant] to hamper economic competition in the marketplace by protecting or compensating resultant losses of commercial interests, opportunities, or advantages."94 Reluctance to interfere with ordinary business conduct or an individual's autonomy is of little relevance, however, where the defendant

already owes a duty of care to do or not do something to someone other than the plaintiffor where the defendant is doing something illegal.95

These factors point to no duty being owed by GM adopters-developers with respect to pure economic loss where neither the plaintiffnor any other person has suffered property damage because of contamination or comingling. In the Australian Perre decision, the defendant-respondent already owed a duty of care to another person, which required them to not act in the way in which they had acted.96 In contrast, besides the duty under consideration, the GM adopter-developer will arguably owe no other duty of care with respect to GMO releases if no property damage has been or will be caused to nonadopters or other third parties.

Further, imposing a duty of care on GM adopters-developers when lawfully releasing GMOs to avoid causing pure economic loss to non-adopters is arguably inconsistent with the legitimate pursuit by the GM adopter-developer of financial gain.97 GM adopters-developers, like non-GM farmers, have a commercial interest in crop production. The non-adopter and GM farmer in some cases may be in economic competition with each other. For example, they may both grow canola intended for a particular overseas market. Therefore, imposing a duty could hinder competition.

Finally, it could be submitted that the non-adopter, by voluntarily adopting a form of agriculture susceptible to adverse consequences if GMOs are released, should not be able to force GM adopters-developers to cease doing something they otherwise could.98 In at least two of the jurisdictions, it is relevant that imposing a duty of care on GM adopters and developers is arguably not in accord with the community standards reflected in the relevant regulations and government policies.99 In Perre and Starlink Litigation the defendant's activity was in breach of relevant regulations.100 GMO releases will be prima facie lawful if there has been compliance with the relevant regulations. 101 Extending liability to pure economic loss where the defendant has complied with regulations may reduce the use of GMOs. Even if insurance is theoretically available, it may not be practically securable because the risk of liability will be difficult to estimate given the potential number of plaintiffs and amounts involved.102 This may have the effect of decreasing the types of agriculture practiced, which may in itself be an adverse consequence for consumers and society. If the plaintiffor another person has suffered property damage though, a duty of care with respect to that damage would be owed. Causing property damage to another is not considered legitimate market competition. This may then place the Canadian or Australian GM adopter in the same position as the defendant-respondent in the Bow Husky and Perre decisions.

3. Control by Defendant

That the defendant has control over the enjoyment of a legal right by another, not necessarily the plaintiff, is a factor in favour of a duty with respect to pure economic loss.103 Non-adopters may argue they have a legal right to pursue any lawful activity on their land, including GM-free

agriculture with no extra costs incurred because of the actions of others and to pursue a premium for being non-GM. The enjoyment of that "right" is in part affected by the GM adopter-developers because their actions determine whether GM-free agriculture remains possible. For example, the non-adopter may be unable to export their produce as a pure non-GM product because of rules of international trade regarding GMO content; they may have to label their produce sold domestically in a particular way because of food or consumer-protection legislation; or may lose their crop premium because of the rules of the relevant organic certification scheme. GM adopters and developers could respond that some (but not all) of the consequences suffered by the non-adopters are outside the control of adopters and developers.

That many of the consequences suffered by the non-adopter are outside the control of the GM adopter-developer, however, is unlikely to mean the GM adopters-developers are not "in control." It is likely a court would instead consider this all the more reason the GM adopters-developers should ensure that they not do something that puts others at risk of not complying with relevant regulations or requirements.104 GM adopters and developers could also argue that the relevant regulators, rather than themselves, are in control: it is regulations that determine whether the activities proceed. It is true that the relevant regulations determine whether a release can lawfully occur, but it is the GM adopter and developer who decide whether to proceed and whether to take additional precautions. GM adopters-developers are aware of the risk to others and GM developers, at least, often know the magnitude of the risk.105 It is therefore likely that a court would find that the GM adopter-developer is in "control."

Finally, it could be asserted that choice of agricultural method, the costs of that method remaining unaffected, and pursuit of a premium for its products are not protected rights for the purposes of the legal concern of control by the defendant. What is included as a right for these purposes is unclear. Anything that can be lawfully done could theoretically be included.106 Choice of agricultural style should not and likely would not be considered a right protected by a duty of care just as a "right" to trade was considered not to be such a protected right by Justice McHugh in Perre.107

A claim to a "right" not to have additional costs imposed by another's chosen method of agriculture, however, is stronger. But even if the defendant is found in control of a risk-producing activity with respect to such a "right" the plaintiff's vulnerability to, or special dependence on, the defendant to control the risk or activity is a more important policy factor in cases of pure economic loss and is discussed next.108

4. Vulnerability-Reliance and Assumption of Responsibility

Stapleton has suggested that protecting the vulnerable is a core value of tort law.109 Justice McHugh in Woolcock Street Investments Pty Ltd. v CDG Pty Ltd. said vulnerability to risk means

"that by reason of ignorance or social, political or economic constraints, the plaintiffwas not able to protect him or herself from the risk of injury."110

At least two indicators are important in the context of the "vulnerability factor"; these are reliance and assumption of responsibility.111 As Baron explains, reliance in this context means an expectation by the plaintiffthat the defendant will use due care towards them.112 The expectation is said to arise from the fact that the defendant knows that the plaintiffis depending upon them to use such care.113 An assumption of responsibility by the defendant to the plaintiffmeans that the defendant has accepted or is deemed by the law to have accepted by their conduct that the defendant will be liable to the plaintifffor the consequences of that conduct.114 Alternatively, the defendant may assume responsibility by generating in the plaintiffan expectation based on the defendant's conduct that such liability will result.115

This approach puts the onus on the plaintiffto protect its own interests and to take steps to avoid or minimize a possible risk of harm to those interests. 116 The court considers whether the plaintiffwas entitled to rely, and was reasonable in relying, on the defendant. If there were other steps the plaintiffcould and should reasonably have taken to protect their own economic interests then the plaintiffmay not be considered to be vulnerable and a duty of care may not be owed.117 On the other hand, if a GM adopter -developer's behavior is risky or unreasonable they may be considered to have assumed responsibility for the consequences of their conduct and a duty may arise. This factor begins to overlap with that of the defendant's control of the relevant risks. Thus non-adopters could argue that because GM developers choose to release GMOs for commercial gain, and secondly, because they are best able to insure against harm because they have the best knowledge of the possible risks and can offset any costs by passing them onto consumers, they are in control and thus owe a duty to anyone injured by their acts.118

In response, given that the GMO release will have been authorized by the relevant regulators, GM developers may assert that their conduct is not risky or unreasonable. In granting authorization to release the GMO, the regulator must have assessed the science-based risks of harm as objectively manageable and acceptable.119 GM developers could therefore assert that with the regulators having struck a balance between the parties' competing interests, the court should not seek to reopen the matter.120 The regulations, however, do not require consideration of all the harms relevant to a court's assessment of duty. For example, under U.S., Canadian and Australian regulations, the economic harms caused by GMO releases are irrelevant. Therefore, that a GMO release is authorized does not necessarily mean that a court would consider that the balance has been struck in the right place and that therefore GM adoptersdevelopers have not assumed responsibility for economic harm caused to others when releasing GMOs.

With respect to insurance and cost offsetting, the availability of insurance to GM adopters should not be a determining factor. As Stapleton points out it is morally incoherent that an equally culpable but uninsurable actor should escape what an insured actor does not.121 Nor should the victim be denied recompense on this basis.122 Further, it could be expected to be easier to assess risk in a first party insurance scenario (for example, a non-adopter purchases insurance to protect against their own risk of pure economic loss) than a third party insurance scenario (for example, a GM adopter purchases insurance to protect against third party claims of pure economic loss). In economic terms then, the non-adopter is the least cost avoider. GM adopters-developers could also assert that non-adopters are able to protect themselves contractually by charging a premium for the additional costs of avoiding contamination or comingling, something that grain farmers, GM or otherwise, cannot usually do. This is a strong argument against finding a duty of care.

With respect to the plaintiff's reliance on the defendant using due care, Justice McHugh in Perre said that if it was reasonably open to the plaintiffto take steps to protect himself then there is no need for a duty of care.123 The Canadian courts take a similar view.124 In the case of GMOs, non-adopters could take some steps to avoid the risk of economic harm or minimize damage to themselves. For example, non-adopters could produce sexually incompatible crops, change their accepted tolerance level for comingling with GMOs, or not enter into contracts pursuant to which they agree to produce non-GM crops. But even if there are precautions available to non-adopters (which will not always be the case), the crucial issue for the court is whether it is reasonable to require non-adopters to take them. How reasonableness at this stage is to be determined is not clear. Presumably it involves many of the same considerations relevant when assessing both the defendant's fault at the breach-of-duty stage as well as when considering whether the plaintiffhas been contributorily negligent.125 Given those considerations, the likelihood of economic harm, the gravity of any harm and the cost and difficulty of taking precautions will all be important. This will require case by case assessment. It seems likely that a court will decide, on policy, that tort law protection should not be denied to plaintiffs who fail to take all but the most straightforward precautions.126 What steps are reasonably to be taken by the plaintiffvaries in each case, but some guidance can be gleaned from the case law.127

In Perre, the appellants took no steps to protect themselves from the effects of the respondent's negligence.128 However, the appellants were not found to have acted unreasonably.129 Justice Callinan said that the appellants were entitled to expect that a person such as the respondent would act carefully and responsibly in carrying out an experimental activity that had a real and acknowledged potential to cause grave harm to the appellants.130 Nonadopters may argue that they also should not be required to take steps to protect themselves. However, in Perre the appellants were unaware of the risk to them posed by the respondent's act.131 They therefore could not be said to have been unreasonable in not taking steps to protect themselves and were instead considered vulnerable by the court. In the Canadian decision Bow Valley, the plaintiffs'

failure to allocate the risk to another when it could have was a factor against finding a duty.132 In GMO-release cases, non-adopters would or should be aware of the risk to them posed by the GM adopter's act. Non-adopters will know of the GM developer's activities at least because of the publicity given to the introduction of GM crops. Common knowledge means both non-adopters and GM adopters should be aware of the risk of harm to others following GMO releases, even where regulators' approval is obtained. Non-adopters are therefore not as vulnerable as the parties in Perre.

GM adopters-developers may assert that insuring against pure economic loss is a reasonable precaution that could be taken by non-adopters. However, as noted above, it is questionable whether the availability of insurance to either party is relevant or a reasonable precaution.133 Justice McHugh in Perre expressly stated that whether the plaintiffis insured is generally irrelevant to the issue of vulnerability.134 In any case, it seems that it will be difficult for either party to insure against such harm.135

What is not clear from the case law is how relevant voluntarily imposed standards of behavior are in cases such as where non-adopters have chosen to refuse to adopt an innovation or contract with third parties in a way that requires others also not to adopt an innovation (such as where organic farmers contract with buyers to provide 100% non-GM grain), which causes the nonadopters their loss. Certainly during the breach and contributory negligence stages, the reasonableness of the plaintiff's behavior is assessed against an objective standard of a "reasonable person" rather than a subjective test of the plaintiff's actual attributes and opinions. Nevertheless, some subjective qualities of the plaintiffare relevant and the crucial concern is whether the choice to be a non-adopter is one that should be taken into account or disregarded as an eccentricity of the plaintiff. GM adopters-developers would likely not be successful in having the court find non-adopters not vulnerable just because they have voluntarily chosen to be a non-adopter, for the same reason the court is reluctant to unduly interfere with the personal autonomy of the defendant in choosing to adopt an innovation, as discussed above. However, this issue needs further exploration.

5. Existing Statutory Regime and Common Law

In Perre, Justice McHugh said that "[w]here another body of law effectively deals with the economic loss, a court should be slow to use negligence law to impose a duty of care on a defendant. This is particularly important where to do so would interfere with a coherent body of law in another field."136 As noted above, the effect of recognizing a duty of care on other legal obligations is also relevant in Canadian law.137 That there are regulatory regimes regulating GMO releases is therefore relevant to whether a court should find a duty of care to avoid pure economic loss.138 "The presence of a statutory regime may, as a matter of policy, be a factor militating against the finding of a duty of care. . . ."139 As a general proposition, a court should not find a

duty of care to avoid pure economic loss if the duty resting upon the tortfeasor would be inconsistent with a duty imposed by a statutory instrument. 140

GM adopters-developers could make two points here. First, GMOs are the subject of a comprehensive system of international and national regulation and are not prohibited, unlike the situation in Perre,141 Starlink Litigation, and the Canadian Sauer case. This is a factor against finding a duty of care. Secondly, in imposing a duty of care on GM adopters or developers in respect to pure economic loss, the law of negligence would arguably be undermining another body of law, that of the statutory regulation of GMOs. It would be intruding into an already established area of law and government policy, the statutory schemes regulating GMO releases. Finding that a duty of care is owed by GM adopters-developers means both parties would need to, in effect, second guess the decisions of the regulators and not proceed with releases that the government, through those regimes, decides can proceed. In the case of GMOs, it would effectively block innovation.

While it is true that GMO releases are comprehensively regulated, the above arguments are unlikely to succeed. It is likely that finding a duty to take reasonable care when carrying out authorized releases would not be considered unacceptable interference with the regulatory schemes.142 Satisfying such a duty of care would not require conduct contrary to such legislation. Furthermore, the relevant regulations do not deal with GM developers' liability to others following approved releases. Non-adopters could therefore submit that the government intended the common law of negligence to apply concurrently with the legislation. A court is likely to agree and conclude that finding a duty of care owed by GM developers is not inconsistent with the relevant regulations and does not interfere with any decision making under the statutes. Furthermore, finding such a duty would not effectively block innovation because the existence of a duty does not guarantee that GM developers will be liable. Compliance with relevant regulations will be relevant in the subsequent assessment of liability. Further, it is arguable that what courts are considering here is the narrower effect of whether a defendant will have to comply with two inconsistent lawful obligations, such as an obligation imposed by regulation and one imposed by common law. The broader repercussions for society of the existence of a duty, such as discouraging the introduction of an innovation, seem outside the balancing of private interests undertaken in a negligence claim.

C. Conclusions Regarding Duty

Predicting the outcome of negligence actions brought by non-adopters with respect to pure economic loss caused by GMO releases is difficult, particularly because of the importance of the facts of each case and because of the policy factors relevant in determining whether a duty of care is owed.143 Different courts and commentators may reach different conclusions with respect to policy matters because of "differences in social and economic conditions and in judicial

assessments of community values and the proper role and scope of tort law."144 Nevertheless, the following conclusions are suggested based on the discussion above.

An Australian court is likely to find that a duty of care arises in such cases. It is less certain whether a Canadian court may find a duty of care, although in light of Sauer it is possible.145 It is unlikely that a U.S. court would find a duty of care if only pure economic loss was suffered.146 The courts in all countries must reconcile two competing interests. The reluctance to unduly interfere with legitimate economic freedom stressed by the Australian High Court in Perre and later cases, the Canadian Supreme Court in Edwards, and U.S. courts through the economic loss doctrine, strongly points to no duty being owed by GM adopters-developers in all jurisdictions. However, nonadopters' economic (and personal) freedom to pursue particular types of agriculture incompatible with GMOs is generally vulnerable to GM adopters'- developers' actions. Therefore in Australia and possibly Canada, unless there is a particular action the non-adopter could take to prevent harm, reconciliation is likely to require a duty be found for two reasons.

First, finding a duty is consistent with an economic analysis of where responsibility should lie. GM adopters, by growing GMOs, are receiving an economic benefit from the activity causing the harm.147 It is appropriate that they therefore owe a duty when taking such action. Secondly, that GM agriculture is regulated would only seem to suggest that it is all the more appropriate that a duty to take reasonable care be owed. While it is arguable that nonadopters have voluntarily chosen to be vulnerable by choosing to remain GM free (and indeed may seek to profit from doing so) and that imposing a duty on GM adopters-developers creates a new restraint on the legitimate business activities of GM adopters-developers and could in effect be a tax on innovation, community standards with respect to culpability where someone interferes with another's preexisting lawful autonomy and way of life seems to demand a duty be owed.

This outcome may seem legally unwise or economically objectionable to those wanting to introduce agricultural biotechnology. However, (putting to one side that the finding of a duty does not mean that GM adopters-developers will be liable in negligence) this reflects an important limitation on the course open to courts. Of the three countries, none of the courts consider, in the policy analysis relevant to duty of care, the factor of lost opportunity costs and foregone benefits to society, the country, or the world as a whole. The court in negligence proceedings is generally balancing private interests. Although during consideration of the factor of the defendant's economic freedom and market competition generally, it comes close to considering broader issues of the effect on the community generally, it is unclear how broadly these issues are examined by courts. But arguments based on an overall national or international benefit to be gained by allowing GM crops to be farmed without any duty of care with respect to pure economic loss to non-adopters seems outside the calculations of the court. Regulation then would seem to be the

way to ensure this broader balancing of risks and benefits to society's interests. This is taken up in the next part.

II. ECONOMIC LOSS AND GOVERNMENT

Innovations impact societies in a myriad of ways. Industrial economies have tended to support the quest for new innovations by rewarding early innovators with patents or monopolies, or both for their technologies. More recently, governments have sustained this quest by providing various federal support mechanisms (for example, grants, tax incentives, infrastructure development, and so forth) for innovative research and development. As an innovation is adopted by the society into which it is commercialized and the technology becomes accepted and valued by the adopters, the negative externalities of the innovation can become apparent.

Insurance is a routine part of agriculture in all three jurisdictions. Agricultural insurance is designed to help offset the risks associated with the production of crops or livestock under adverse circumstances.148 For example, hailstorms, drought or flooding with crop agriculture and lightning strikes in the case of livestock agriculture. Crop insurance is based on the farmer ensuring compensation, should the yield fall below established yield benchmarks for crop and geography. The essence of crop insurance is that the farmer has a mechanism to dilute the risk of having a crop failure because of adverse weather effects. All forms of this kind of insurance are offered by private and public insurance firms and farmers purchase the insurance to provide them with fiscal compensation should their yield fall below the relevant benchmark. 149 It is important to highlight that these forms of insurance are all for physical damage to the crop, not for compensation because of the inability to sell into selected niche markets. Compensation is provided for some specialty agriculture markets, but only for uncontrollable natural hazards. Compensation is not provided for "[l]osses that are controllable or could have been prevented with sound farm management practices."150 This is interpreted by the authors to mean that nature-related impacts can be insured against, but the loss of an organic premium because of the adventitious presence of trace amounts of GM crops cannot be insured against because the insurance industry deems comingling- contamination to be preventable.

n most instances, negative externalities are dealt with through the provision of insurance. In the event that an externality develops, firms or individuals can purchase insurance that will compensate them should the externality affect them.151 It can take time for the insurance industry to respond to the demands for insurance. An example of this can be found in the auto industry. The use of autos increased rapidly in the first two decades of the 20th century and during this period, it became evident that while there were numerous advantages to the growing use of autos, there were also some problems. The increased use of automobiles caused accidents, resulting in injury and death. Massachusetts was the first American state to enforce compulsory

motor vehicle insurance in 1927.152 Similarly in Australia, third party insurance to ensure recompense for victims of auto accidents has been compulsory for about 75 years.153

The challenge with the innovation of GM crops is that no insurance firms have offered insurance against comingling or harms alleged to be caused simply by the growing of GMOs. Insurance firms have been asked to provide insurance, but the response from the insurance industry has been that it is, so far, unable to determine the risk threshold for comingling and therefore, their actuaries cannot determine the price of an insurance premium to charge potential clients.154 At the present time, the insurance industry is unable to provide insurance against negative externalities that result from the production of GM crops.

Normally, regulations are used to manage the safe and efficient use or application of a product or technology where harm of some kind may be caused. In the case of GM crops in Australia, regulatory review and oversight to protect human health and safety and the environment is a federal jurisdiction and done by the Gene Technology Regulator (GTR).155 In the early years of the 21st century, although the GTR approved the commercialization of GM crops in Australia, because of public concerns,156 most States imposed a moratorium on the technology on the basis of economic concerns.157 Most of the moratoriums were enacted in 2004 and were for a period of three years. By 2007, considerably more was known about GM crops and their impacts and several States began the cautious approval of GM crop production.158

In terms of commercializing GM crop technologies, Canada and the United States are global leaders. Public concerns simply were not an issue in the early to mid 1990s, when the initial crop varieties were proceeding through the regulatory system. This is not to say that there was no public awareness of the issue, but rather, the social voice was not loud enough to trigger any political involvement. In fact, according to many of the biotech pioneers, the agricultural biotechnology industry asked for more rigorous regulatory requirements than what were offered by federal regulators.159 While regulations were used to ensure the safety of these crop varieties, once they were approved, the capacity to regulate the technology ceased. At this point, the onus of responsibility fell to industry. If those that chose not to adopt the technology felt that they were being adversely affected, it would be the responsibility of their industry to develop a management system or production protocols to protect their production practices.

Direct federal or state-provincial regulation in North America was not an option to address possible economic loss because regulators do not have the mandate to control products in the marketplace that have been approved for commercial use as long as the products are not causing safety-related problems. Economic loss is not considered to be a safety issue. Therefore, we turn our attention to other government options.

Negative externalities can be managed and in some cases prevented through the use of taxes. The emission of pollution from factories is a negative externality that has been managed through the application of a tax. Pigou proposed a tax on externalities as a means of limiting or removing the presence of negative externalities in society.160 A Pigovian tax is a fee that is paid by a polluter usually to the government, based on the units of pollution.161 This tax, if implemented at the correct level, is socially efficient as it removes the deadweight loss associated with the tax.162

While on the surface, levying a Pigovian tax on the innovation of GM crops would seem like a remedy to the challenge of lost premiums and additional costs for non-adopters, as one delves deeper into the issue, it is not. For example, in 2010 in Western Canada, 93% of the canola production was genetically modified, herbicide tolerant (GMHT), and a further 6% was mutagenic herbicide tolerant, leaving only 1% of the canola produced in Western Canada as being varieties that are not herbicide tolerant.163 In the United States, the adoption rate for GM soybeans is 90%, while the rates for cotton and corn range from 70%-80%.164 In Australia, GM cotton accounts for over 90% total production.165 All of the GM varieties of these crop types have been approved for production by the relevant regulatory agencies, thereby making their classification as pollution in the Pigovian sense a challenge.

This starts to get to the heart of the matter of pure economic loss caused by GM crops by documenting that the "winners" far outnumber the "losers" and raising the question whether society should step in and argue that nonadopter rights are equal to adopter-developer rights, and therefore compensation should be available regardless of how few non-adopters are affected. In the absence of an insurance market, should the state be willing to protect the economic rights of the individual? Safety and civil liberty are completely separate issues and the concept of economic rights starts to push the boundaries of accepted norms. The basic tenant of market economies is that individuals have a right to make a profit, but there are no limits on the degree of profit maximizing. If there is no ceiling to profit, by equality, there should be no floor or minimum threshold of profit that an individual should expect.

Based on Pigou, it is possible to extend the concept of negative externalities to the individual level, so that even if one person is adversely affected by something, it can be said to create the potential for an economic loss to that individual. The potential of this situation can be construed as not being a Pareto improvement. Situations are said to be a Pareto improvement where at least one person is made "better off" without making another person "worse off."166 Based on the combined theory of Pigou and Pareto, GM-crop commercialization that adversely affects non-adopters would establish that nonadopters have been made "worse off" because of the negative externalities of lost premiums and increased costs.

The Kaldor-Hicks criteria, however, can address this situation.167 In an attempt to propose a means of allowing innovation that would result in the non-adopters not being made worse off, Kaldor and Hicks proposed an improvement that would be Pareto efficient, provided two criteria were followed. The Kaldor-Hicks criteria holds that: first, if the "winners" of an innovation are able to compensate the "losers" then the innovation is a Pareto improvement; and second, if the "losers" are unable to bribe the "winners" to prevent the commercialization of the innovation it is also an improvement.168 The first criterion could be a tax of some type that is less than the level of benefits from adopting the innovation. Assuming the tax is lower than the net benefit, there would be an improvement for the adopters, albeit at a lower level. The pool of revenue from the adoption tax would theoretically be used to provide compen- sation to those non-adopters that have been adversely effected.169 Provided the compensation is at least equal to the losses suffered by the non-adopter, they are, in terms of Pareto efficiency, no worse off. The first criterion only partially holds as the global biotechnology industry has developed "the Compact," a liability compensation mechanism for biodiversity damage.170 No compensation for non-adopter economic loss is provided for in the Compact.

The latter criterion holds because the number of non-adopters is not large and the ability of non-adopters to bribe the multinational seed development firms is virtually nonexistent. If non-adopters were in a situation to be able to bribe the commercializers of innovation, this would not be Pareto efficient as the benefits of the innovation would not be realized, and hence the GM adopters and developers would be made worse off. Hypothetically, the firm doing the commercialization could be compensated for their costs, but the lost future profits would not be accounted for, nor any of the increased profits that the GM adopters would expect. With the loss of the innovative technology, potential GM adopters would be worse off. Removing the ability to bribe GM developers or GM adopters, or both keeps the Kaldor-Hicks criteria as Pareto efficient.

If an economic loss compensation scheme for non-adopters of GM crops were to be established, it would ultimately be undertaken by a federal government. Denmark has established such a compensation scheme.171 The redistribution of wealth has taxed many a society and government. The variety of wealth redistribution programs and mechanisms are diverse and according to Alston and his coauthors, many economists assumed that the cost of wealth redistribution, regardless of the economic sector, was equal to the revenue that was redirected.172 These original assumptions held that the redistribution of money by government was costless. This is obviously not the case and research provides estimates on the marginal social welfare cost that range from $1.20 to $1.50 for every dollar distributed.173 In a review of this literature, Fullerton reconciled the results and suggests that the marginal cost of taxation (in the United States) is considerably lower than first thought, ranging from $1.07 to $1.25.174 In essence, for every $1 of government revenue that is redistributed, it will cost between 7 and 25 percent to do this, thus reducing the amount of revenue that is available to be redistributed.

While the cost of redistribution of monies is an important one, it is not the main concern. Compensation schemes that are mandated by government, regardless of who funds them, do not address the problem. The allocation of compensation to non-adopters does not get at the heart of the claims of harm by non-adopters even when there has been no comingling; it will not end the challenge of pure economic loss. This is especially the case if funds from general government revenue are used to fund the compensation scheme as opposed to making certain that tax revenue from a Pigovian form of tax are used. The involvement of government in addressing the negative externality ultimately means that the externality will increase over time as the rate of adoption increases.

III. MOVING FORWARD

As Stein and Rodríguez-Cerezo highlight, the number of commercial traits in the marketplace is expected to triple in the coming five years.175 If non-adopters are feeling pressured given the current adoption rates of GM crops, that pressure can only be expected to increase exponentially over the coming decade. Insurance firms are not clamouring to provide insurance to the agriculture biotechnology industry. So, what options remain?

By relying on the courts to respond to non-adopters' rights, society is leaving it to the courts to decide whether the choice not to adopt or be affected by GMOs is a legal right, the interference with which should be compensated. If courts in a particular country decide there is no duty of care, they are effectively deciding that there is no legal right to not be affected by a new technology. While this accords with past practices in the case of claims of harm based simply on new competition, it is new ground where claims of lost opportunity to farm, or increased costs of farming, without an innovation are concerned. If the court decides there can be a legal duty, that does not necessarily answer the question of whether GM agriculture is undesirable or whether protection and compensation should be provided to non-adopters because the remainder of the ingredients (such as lack of reasonable care and causation of actual damage) to succeed in negligence still must be present. But it means it is foreseeable that harm could be caused if reasonable care is not taken to avoid it and lack of clarity about what that care requires may block or hinder the introduction of a worthwhile innovation.

It is not in the best interests of non-adopters, GM adopters, developers, or society that the courts in effect determine the type of agriculture farmers can pursue and whether an innovation is adopted. First, as shown in this article, leaving the issue to the courts creates considerable uncertainty. Such uncertainty is undesirable if GMO innovation is to be encouraged. Secondly, private actions between two parties are not the appropriate forum in which to determine whether the social and economic impacts of GMO releases are such that GMO commercialization should or should not proceed. The economic interests of the whole society must be adequately weighed in

any balancing process. As suggested by Ogus and Richardson in relation to other matters, courts are likely to find that "the principle of justice which postulates that existing property rights must be protected even where the result will impose greater costs on society at large" requires decisions in favor of non-adopters.176 Further, in many cases the courts will be able to consider the matter only after harm of some sort has occurred. Thirdly, such matters are complex in terms of the policy decisions that must be made.177 Policy on the matter should (and probably can only) be determined by government in light of society's best interests, not those of the parties before a court.

It is also possible that as between the United States, Canada, and Australia, the courts will answer the duty question differently. In considering a range of legal concerns to decide whether there is a duty, this decision presumably reflects the views and attitudes of that country's society regarding those concerns. Those attitudes may show whether the particular society has an innovator or traditional technology bias-particularly their willingness to describe something as a "worthy harm" that will be compensated through the courts or whether, as evidenced by a finding by their courts of no duty of care for policy reasons, the preference is for the innovator. However, it must also be remembered that different common law jurisdictions take a different attitude toward claims for pure economic loss generally and that if it is argued that there is nothing special about GM technology compared to any other innovative technology, it makes sense for the relevant courts to follow the precedents of that jurisdiction-such that there is often no duty for pure economic loss in the United States but may be in Australia and Canada.

The other aspect of non-adopters rights raises the question of if compensation is to be provided to non-adopters, who should provide it: The society getting the advantage of the innovative technology, the farmers who adopt GM, or the GM developer responsible for the particular GMO that caused the harm? In jurisdictions such as Denmark, where a revenue pool is used to compensate, society has decided that non-adopters should be compensated whether or not there is a right to be a non-adopter or a right not to be affected by new technology.178 In essence, they have created such a right and it is worth whatever the fund gives to them. The above analysis of the economic efficiencies of having such funds via government efforts shows this is inefficient. It is also inflexible and does not allow the individual circumstances of each case to be taken into account.

Where the GM adopter or developer is asked to provide the compensation, whether through providing the revenue pool as in Denmark, or pursuant to judgments by the courts, it must be asked whether it is appropriate that those acting in compliance with relevant regulations must pay wherever nonadopters suffer harm because of their own self-imposed standards. Two justifications could be suggested-because the "polluter should pay" and because GM developers are releasing GMOs for financial profit.179 The first justification "rests on the idea that those who cause harm to

others ought to bear responsibility for it."180 However, while this may be fair where the "polluter" could have taken precautions to prevent the harm as may be the case in some GM scenarios,181 that it is not fair where the "polluter" could not have done anything different except perhaps not pursue GM agriculture at all. GM adopters and developers who comply with the law but nevertheless cause harm to another only because of some standard set by the non-adopter should not be liable unless the GM adopter or developer is in some other way at fault. To do otherwise would, in effect, make them strictly liable. With respect to the second justification, other farmers are also seeking a financial profit and that ambition will often be the motive for their adopting self-imposed limitations such as organic agriculture. A decision to impose liability only on GM adopters or developers would be a political decision to prefer one group to another.

Similarly, prohibiting the introduction of GMOs where there are nonadopters within a particular jurisdiction is not a fair or economically defensible solution.182 While it is acknowledged that the rights of all farmers should be respected, such a provision would mean that the rights of non-adopters to choose which type of agriculture to pursue would always dominate those of GM adopters.

A suggested practical solution then, for some scenarios at least, lies in the setting of domestic policy and an international trade agreement on low-level presence (LLP) or adventitious presence (AP). Trade cannot and will not function at thresholds of zero percent. There are two important aspects to this solution: First, how to deal with the presence of approved GM crop variety and second, how to manage unapproved varieties.183 Approved varieties at a domestic level would be relatively straightforward. A threshold would be set (such as 1%) and any degree of commingling below this level could not be treated as substantially different by non-adopters. This, however, does not deal with international markets. While domestic regulations can be implemented to resolve the issue for internal markets, it is not guaranteed that a foreign buyer of non-GM crops would be willing to accept domestic comingling thresholds. The second aspect, concerning unapproved varieties, might also be addressed through the establishment of a threshold, albeit at a lower level.184 Regardless of what threshold level is established, input from all aspects of agriculture should be required and thresholds acceptable to the international markets will be necessary.

Thresholds of this nature would allow many non-adopters to still be able to farm as they choose, without having to incorporate additional costs to avoid GM crops and to sell their produce into whatever market they desire without worry of rejection. Such agreements would also allow a political decision to be made regarding how to respond to the legal challenges raised by non-adopters balanced against the consequences of not allowing GM agriculture to proceed. Without agreements of this nature, it is conceivable that by the end of the coming decade the innovation of GM crops will simply be mired in a series of liability lawsuits.

Sidebar

CITATION: Karinne Ludlow and Stuart J. Smyth, The Quandary of Agricultural Biotechnology, Pure Economic Loss, and Non-Adopters: Comparing Australia, Canada, and the United States, 52 Jurimetrics J. 7-41 (2011).

Footnote

1. The introduction of GM crops could also produce economic benefit for non-adopters. For example, introduction of GM crops may increase demand for organic produce, providing an economic gain for non-GM farmers. Further, as pointed out in an Australian study, there may be environmental benefits such as a decrease in the volume of agricultural chemicals used or use of less persistent agricultural chemicals, which might mean organic producers can adopt less costly agricultural chemical contact avoidance measures. STEPHEN APTED & KASIA MAZUR, AUSTL. BUREAU OF AGRIC. & RES. ECON., POTENTIAL IMPACTS FROM THE INTRODUCTION OF GM CANOLA ON ORGANIC FARMING IN AUSTRALIA, ABARE RESEARCH REPORT 07.11, at 30 (2007), available at http://adl.brs.gov.au/data/warehouse/pe_abare99001362/organic_farming.pdf. In terms of agricultural sustainability, it has been claimed that GM canola is the most environmentally beneficial crop technology used today. When it is planted, its better control of weeds or insects, or both, has an area-wide benefit, meaning fewer weeds' seeds for neighbors and fewer insects to damage neighbors' crops. See Stuart J. Smyth et al., Environmental Impacts from Herbicide Tolerant Canola Production in Western Canada, 104 AGRIC. SYS. 403-10 (2011); W.D. Hutchison et al., Areawide Suppression of European Corn Borer with Bt Maize Reaps Savings to Non-Bt Maize Growers, SCIENCE, Oct. 8, 2010, at 222, 222-25; Bruce E Tabashnik, Communal Benefits of Transgenic Corn, SCIENCE, Oct. 8, 2010, at 189, 189-90.

2. PETER T. BURNS & JOOST BLOM, ECONOMIC INTERESTS IN CANADIAN TORT LAW 3 (2009).

3. See, e.g., Statement of Claim paras. 26-27, Hoffman v. Monsanto Can. Inc., 2005 SKQB 225, 264 Sask. R. 1 (Can. Sask. Q.B.) (No. 67), available at http://www.saskorganic.com/oapf/pdf /stmt-of-claim.pdf (claiming that non-GM canola has been lost to organic farmers in Saskatchewan as a market crop and crop rotational tool). With respect to labelling changes if there has been GM comingling or contamination, see ACCC Watches New Labelling of GM Foods, AUSTRL. COMPETITION & CONSUMER COMM. (Jan. 18, 2002), http://www.accc.gov.au/content/ index.phtml/itemId/87952/fromItemId/378014.

4. BURNS & BLOM, supra note 2, at 2.

5. Liability Issues Associated with GM Crops in Australia, AUSTL. GOV'T DEP'T OF AGRIC., FISHERIES & FORESTRY (Sept. 2009), http://www.daff.gov.au/__data/assets/word_doc/0007/182 842/liability_issues_paper_final.doc (citing ORGANIC FED'N OF AUSTL., SUBMISSION NO. 54 TO THE SENATE CMTY. AFFAIRS REFERENCES COMM. (2000)).

6. Id. (quoting FLORIGENE LTD. & NUGRAIN PTY LTD., SUBMISSION NO. 42 TO THE SENATE CMTY. AFFAIRS REFERENCES COMM. (2000)).

7. See MAX FOSTER, AUSTL. BUREAU OF AGRIC. AND RES. ECON., GENETICALLY MODIFIED GRAINS: MARKET IMPLICATIONS FOR AUSTRALIAN GRAIN GROWERS, ABARE RESEARCH REPORT 01.10, at 2 (2001), available at http://adl.brs.gov.au/data/warehouse/pe_abarebrs99000 702/PC12137.pdf.

8. Statement of Claim, supra note 3, paras. 26-27.

9. CLIVE JAMES, INT'L SERV. FOR THE ACQUISITION OF AGRI-BIOTECH APPLICATIONS, GLOBAL STATUS OF COMMERCIAL BIOTECH/GM CROPS, ISAAA BRIEF NO. 41, at 15 (2009), available at http://www.isaaa.org/resources/publications/briefs/41/download/isaaa-brief-41-2009. pdf.

10. Both Canada and the United States have "right-to-farm" statutes in their provinces and states. These prevent the suing of neighboring farmers for what is considered standard farming practices. See, e.g., Agricultural Operations Act, S.S. 1995, c. A-12.1 (Can. Sask.). Such statutes raise the question of when an innovation becomes standard. See Jane Matthews Glenn, Footloose: Civil Responsibility for GMO Gene Wandering in Canada, 43 WASHBURN L.J. 547, 556-57 (2004); Jonathan J. Kalmakoff, "The Right to Farm": A Survey of Farm Practices Protection Legislation in Canada, 62 SASK. L. REV. 225, 242-44 (1999); Alexandra B. Klass, Bees, Trees, Preemption and Nuisance: A New Path to Resolving Pesticide Land Use Disputes, 32 ECOLOGY L.Q. 763, 814 (2005).

11. Some States of Australia allow for compensation under State legislation in limited circumstances. See Karinne Ludlow, Cultivating Chaos: State Responses to Releases of Genetically Modified Organisms, 9 DEAKIN L. REV. 1, 22 (2004).

12. HOUSE OF REPRESENTATIVES STANDING COMM. ON PRIMARY INDUS. & REG'L SERVS, WORK IN PROGRESS: PROCEED WITH CAUTION. PRIMARY PRODUCER ACCESS TO GENE TECHNOLOGY para. 7.108 (2000) (Austl.) See also SENATE COMM. ON CMTY. AFFAIRS, A CAUTIONARY TALE: FISH DON'T LAY TOMATOES: A REPORT ON THE GENE TECHNOLOGY BILL 2000, at 152 (2000) (Austl.). The Australian government reviewed the regulations in 2006. See DEP'T OF HEALTH & AGEING, STATUTORY REVIEW OF THE GENE TECHNOLOGY ACT 2000 AND THE GENE TECHNOLOGY AGREEMENT 38-42 (2006). The government decided against adding strict liability for contamination, id. at 38-39, a compensation fund, id. at 39-41, or mandatory insurance, id. at 41-42. Similarly, in Canada, the Canadian Biotechnology Advisory Committee concluded that specific provisions for damage caused by biotechnology products were not required. CAN. BIOTECHNOLOGY ADVISORY COMM., PATENTING OF HIGHER LIFE FORMS AND RELATED ISSUES: REPORT TO THE GOVERNMENT OF CANADA BIOTECHNOLOGY MINISTERIAL COORDINATING

COMMITTEE 14, 17 (2002), available at http://dsp-psd.pwgsc.gc.ca/Collection/C2- 598-2001-2E.pdf. Compare other jurisdictions such as Denmark and Germany, where compensation schemes have been established. Lov nr. 436 af 9.6.2004 om dyrkning m.v. af genetisk modificerede afgrøder [Act on the Growing etc. of Genetically Modified Crops, No. 436 of June 9, 2004] § 9 (Den.), available at http://retsinformation.w0.dk/Forms/R0710.aspx?id=8035, translated in http://www.naturschutzrecht.net/Gentechnik/GenTG_DK.pdf; Gesetz zur Regelung der Gentechnik, [Gentechnikgesetz] [Genetic Engineering Act], June 20, 1990, BUNDESGESETZBLATT, TEIL I. [BGBL. I] at 2006, §§ 32-37, as amended by Gesetz [G], Dec. 9, 2010, BGBL. I. at 1934, art. 1 (Ger.), available at http://www.gesetze-im-internet.de/bundesrecht/gentg/gesamt.pdf. For a comparison between the Danish and German statutory regimes, see generally Stuart J. Smyth & Drew L. Kershen, Agricultural Biotechnology: Legal Liability Regimes from Comparative and International Perspectives, GLOBAL JURIST ADVANCES, Apr. 2006, at 1, http://www.bepress.com.ezproxy.lib.monash.edu.au/ gj/advances/vol6/iss2/art3.

13. Hoffman v. Monsanto Can. Inc., 2005 SKQB 225, 264 Sask. R. 1, para. 24 (Sask. Q.B.)

14. FRANCIS TRINDADE ET AL., THE LAW OF TORTS IN AUSTRALIA 492 (4th ed. 2007).

15. There is considerable literature concerning tort liability and GM crops. See, e.g., Troy Anderson, Seeds of Conflict: Potential Legal Issues with Genetically Modified Crops, AUSTL. PRODUCT LIABILITY REP., May 2008, at 25; Rebecca M. Bratspies, Myths of Voluntary Compliance: Lessons from the StarLink Corn Fiasco, 27 WM. & MARY ENVTL. L. & POL'Y REV. 593 (2003); A. Bryan Endres, Coexistence Strategies, The Common Law of Biotechnology and Economic Liability Risks, 13 DRAKE J. AGRIC. L. 115 (2008); Kathryn Garforth & Paige Ainslie, When Worlds Collide: Biotechnology Meets Organic Farming in Hoffmann v Monsanto, 18 J. ENVTL. L. 459 (2006); Neil D. Hamilton, Legal Issues Shaping Society's Acceptance of Biotechnology and Genetically Modified Organisms, 6 DRAKE J. OF AGRIC. L. 81 (2001); Drew L. Kershen, Legal Liability Issues in Agricultural Biotechnology, 44 CROP SCI. 456 (2004); Maria Lee & Robert Burrell, Liability for the Escape of GM Seeds: Pursuing the "Victim"?, 65 MOD. L. REV. 517 (2002); Karinne Ludlow, The Economic Impact of Genetically Modified Organisms as Actionable Damage in Torts, 13 TORTS L.J. 159 (2005) [hereinafter Ludlow, Economic Impact]; Karinne Ludlow, Genetically Modified Organisms and Private Nuisance Liability, 13 TORT L. REV. 92 (2005); Gregory N. Mandel, The Future of Biotechnology Litigation and Adjudication, 23 PACE ENVTL. L. REV. 83 (2006); Joshua B. Cannon, Note, Statutory Stones and Regulatory Mortar: Using Negligence Per Se to Mend the Wall Between Farmers Growing Genetically Engineered Crops and Their Neighbors, 67 WASH. & LEE L. REV. 653 (2010); Thomas Connor, Comment, Genetically Modified Torts: Enlisting the Tort System to Regulate Agricultural Contamination by Biotech Crops, 75 U. CIN. L. REV. 1187 (2007); Richard A. Repp, Comment, Biotech Pollution: Assessing Liability for Genetically Modified Crop Production and Genetic Drift, 36 IDAHO L. REV. 585 (2000).

16. Jane Stapleton, Comparative Economic Loss: Lessons from Case-Law-Focused "Middle Theory", 50 UCLA L. REV. 531, 542-43 (2002).

17. MARK LUNNEY & ROBERT BURRELL, AUSTL. CENTRE FOR INTELLECTUAL PROP. IN AGRIC., A FARMER'S CHOICE? LEGAL LIABILITY OF FARMERS GROWING CROPS § 3.7 (2006).

18. For a discussion explaining why economic high theory has little influence over the appellate courts in Canada and Australia, see Stapleton, supra note 16, at 533.

19. Other scholars have explored the effects of tort liability on voluntary precautionary studies of new products, though they have assumed the existence of harm to human health. See, e.g., David A. Dana, When Less Liability May Mean More Precaution: The Case of Nanotechnology, 28 UCLA J. ENVTL. L. & POL'Y 153, 157 (2010). We consider here the situation of economic loss without the human-harm requirement.

20. BURNS & BLOM, supra note 2, at Preface.

21. A brief description of the types of losses that may be included in the term pure economic loss in the context of GM crops is given in pp. 8-9 above. However, it can be expected that there will be some differences between jurisdictions in the classification of harm in this context as property damage rather than pure economic loss. That issue is outside the scope of this paper but regarding the Australian position see Ludlow, Economic Impact, supra note 15, passim.

22. Hill v Van Erp (1997) 188 CLR 159, 211 (Austl.); Cooper v. Hobart, 2001 SCC 79, [2001] 3 S.C.R. 537, para. 30 (Can.).

23. See In re Genetically Modified Rice Litigation, 666 F. Supp. 2d 1004, 1015-16 (E.D. Mo. 2009).

24. Peter Benson, The Problem with Pure Economic Loss, 60 S.C. L. REV. 823, 832 (2009).

25. Id. at 831.

26. Canadian Nat'l Ry. Co. v. Norsk Pac. Steamship Co., [1992] 1 S.C.R. 1021, 1049 (Can.) (quoting Bruce Feldthusen, Economic Loss in the Supreme Court of Canada: Yesterday and Tomorrow, 17 CAN. BUS. L.J. 356, 357-58 (1991)).

27. Brooks v. Canadian Pac. Ry. Ltd., 2007 SKQB 247, 298 Sask. R. 64, para. 74 (Can. Sask. Q.B.).

28. Edwards v. Law Soc'y of Upper Can., 2001 SCC 80, [2001] 3 S.C.R. 562, para. 9 (Can.).

29. Lara Khoury & Stuart Smyth, Reasonable Foreseeability and Liability in Relation to Genetically Modified Organisms, 27 BULL. OF SCI., TECH. & SOC'Y 215, 223 (2007) (citing Cooper v. Hobart, 2001 SCC 79, [2001] 3 S.C.R. 537 (Can.)).

30. Cooper v. Hobart, 2001 SCC 79, [2001] 3 S.C.R. 537, para. 37 (Can.).

31. Edwards, 2001 SCC 80, [2001] 3 S.C.R. 562 , para. 10 (Can.).

32. See Khoury & Smyth, supra note 29, at 223.

33. This term was used by Justice Gummow in Perre v Apand Pty Ltd. (1999) 198 CLR 180, 253 (Austl.). See also id. at 254. Chief Justice Gleeson agreed with Justice Gummow's conclusions. Id. at 194. See also id. at 326 (Justice Callinan, outlining factors relevant to the case); Graham Barclay Oyster Pty Ltd. v Ryan (2002) 211 CLR 540, 628 (Austl.). With respect to criteria suggested to be relevant to liability for pure economic loss following High Court's decisions in the area, see Peter Cane, The Blight of Economic Loss: Is There Life After Perre v Apand?, 8 TORTS L.J. 246, 248 (2000).

34. Sullivan v Moody (2001) 207 CLR 562, 580 (Austl.); Johnson Tiles Pty Ltd. v Esso Austl. Pty Ltd. [2003] VSC 27, (2003) Aust Torts Reports ¶81-692, para. 742 (Austl.); Stapleton, supra note 16, at 583; Rashda Rana, Negligence and Pure Economic Loss: The Dance of the Seven Veils, 1999 AUSTL. CONSTRUCTION L. NEWSL. 50, 50.

35. See Reynolds v Katoomba RSL All Servs. Club Ltd. (2001) 189 ALR 510, 546 (Austl.).

36. Dowdel v Knispel Fruit Juices Pty Ltd. [2003] FCA 851, (Unreported, Selway J, Aug. 13, 2003) para. 73 (Austl.).

37. See Johnson Tiles, [2003] VSC 27, (2003) Aust Torts Reports ¶81-692, para. 755 (analyzing Perre). Re control, see Hill v Van Erp (1997) 188 CLR 159, 198-99, 234 (Austl.).

38. As Justice Gillard notes,

[a] consideration of the cases enables one to compile a list of relevant matters in determining the question of duty of care. However, one has to proceed with caution, as some of the matters are not necessarily relevant to a particular claim for purely economic loss and others may be relevant but may be accorded different weight depending upon the circumstances. Of course, the list is not exhaustive and other matters may be considered relevant in a particular case.

Johnson Tiles, [2003] VSC 27, (2003) Aust Torts Reports ¶81-692, para. 735 (Austl.). See also the warning of Justice McHugh in Crimmins v Stevedoring Indus. Fin. Comm. (1999) 200 CLR 1, 33-34 (Austl.).

39. STUART J. SMYTH ET AL., INNOVATION AND LIABILITY IN BIOTECHNOLOGY: TRANSNATIONAL AND COMPARATIVE PERSPECTIVES 27 (2010).

40. These obligations are imposed pursuant to the Gene Technology Act 2000 (Cth) ss 61, 62.

41. For the USDA's Animal and Plant Health Inspection Service (APHIS) regulation of biotechnology, see Permits Notifications & Petitions, USDA-APHIS, http://www.aphis.usda.gov/biotechnology/submissions.shtml (last visited July 4, 2011).

42. In re StarLink Corn Prods. Liab. Litig. (StarLink Litigation), 211 F. Supp. 2d 1060 (N.D. Ill. 2002). On the StarLink litigation generally, see D.L. Uchtmann, Starlink(TM)-A Case Study of Agricultural Biotechnology Regulation, 7 DRAKE J. AGRIC. L. 159 (2002), and Bratspies, supra note 15.

43. StarLink Litigation, 211 F. Supp. 2d at 1062. Split approvals (that is, approval for animal but not human consumption) are no longer allowed in the United States or Canada. At the time of detection, they were allowed, and the U.S. Environmental Protection Agency (EPA) had not ruled on the food consumption issue. The EPA was concerned that the protein (Cry9C) produced as a result of the genetic modification took longer to break down in the human stomach than other proteins and that this extra time could create the potential for an allergic reaction. The developer expected food approval and, because it had feed approval, it went ahead with commercialization, but the segregation system failed. Although the EPA was leaning toward approval, after the segregation failure, it instead deemed the corn unfit for human consumption. Uchtmann, supra note 42, at 190-92, 201.

44. StarLink Litigation, 211 F. Supp. 2d at 1062. The case was settled out of court for US$110 million on 7 April 2003. Khoury & Smyth, supra note 29, at 222.

45. Sample v. Monsanto Co., 283 F. Supp. 2d 1088, 1090 (E.D. Mo. 2003).

46. Id. at 1091.

47. Id.

48. See also Agra Marke, Inc v. Aventis CropScience USA LP, No. MDL 1403, 2005 WL 327020 (N.D. Ill. 2005), a subsequent StarLink Litigation-induced suit where the plaintiffclaimed damages for loss of premium for conventional corn and claimed part of the Starlink Litigation settlement

monies. Id. at *1-2. The Court ruled that the plaintiffdid not have a claim because the crops had not suffered direct physical injury while owned by the plaintiff. Id. at *4.

49. In re Genetically Modified Rice Litigation, 666 F. Supp. 2d 1004, 1015 (E.D. Mo. 2009).

50. See Louisiana ex rel Guste v. M/V Testbank, 752 F.2d 1019, 1023 (5th Cir. 1985).

51. Genetically Modified Rice Litigation, 666 F. Supp. 2d at 1017.

52. Id. at 1016.

53. Id. at 1016-17.

54. Benson, supra note 24, at 843-45. This argument is first made in relation to relational economic loss, but later in the article it is made regarding all negligence claims. See id. at 866.

55. Id. at 874. Those rights could be proprietary, possessory or contractual. Id. at 846.

56. Id. at 867-68.

57. Hoffman v. Monsanto Can. Inc., 2007 SKCA 47, 293 Sask. R. 89 (Sask. C.A.), leave to appeal denied, [2007] 3 S.C.R. x. This is a continuation of Hoffman & Beaudoin v. Bayer CropScience and Monsanto, a class action brought on behalf of 1250 certified organic grain farmers of Saskatchewan after Monsanto Roundup Ready canola and Bayer's Liberty Link canola was found on organic farmers land. The Queen's Bench for Saskatchewan dismissed a claim for compensation to be certified as a class action because not all (or even a significant minority) of the plaintifforganic farmers were financially damaged by the alleged contamination. Hoffman v. Monsanto Can. Inc., 2005 SKQB 225, 264 Sask. R. 1, paras. 22, 64, 341 (Sask. Q.B.), aff'd, 2007 SKCA 47, 293 Sask. R. 89 (Sask. C.A.). The court also believed the claim did not disclose a plausible legal basis for imposing liability on the defendant on basis of, inter alia, negligence. Id. para. 62. Khoury & Smyth, supra note 29, at 222, consider that even though organic farmers were foreseeable victims, the court found there was not a sufficient proximate relationship between manufacturers and organic farmers to warrant a duty of care. This decision was then appealed to the Saskatchewan Court of Appeal, the decision of which we discuss in this article. The case was appealed to the Canadian Supreme Court, but that court declined to hear the case, giving no reason. Hoffman v. Monsanto Can. Inc., [2007] 3 S.C.R. x.

58. Hoffman v. Monsanto Can. Inc., 2007 SKCA 47, 293 Sask. R. 89, paras. 77, 86 (Sask. C.A.).

59. Id., paras. 59-61. In Schmeiser v. Monsanto Canada Inc., the plaintiffsought damages for the cost of removing volunteers from her organic garden, alleging that the volunteers were GM.

Schmeiser v. Monsanto Can. Inc., No. 18/04, slip op. para. 1 (Sask. Provincial Ct. June 15, 2005). The Provincial Court of Saskatchewan dismissed the claim, finding that the plaintifffailed to prove that the GM volunteers were the defendant's Roundup Ready plants. Id. para. 42. In obiter dictum, the Court added that the defendant did not owe a duty of care to the plaintiffto ensure there was no unwanted spread of its GM canola. There was no explanation for this in the judgment. Id. para. 49. For coverage of the case in the local news, see Pat Peckover, Supreme Court Duo Battle in Small Claims Court, HUMBOLDT J., Mar. 31, 2005, at 8.

60. BURNS & BLOM, supra note 2, at 392-93.

61. Id. at 393.

62. 2007 SKCA 47, 293 Sask. R. 89, para. 60.

63. Bow Valley Husky Ltd. v. Saint John Shipbuilding Ltd., [1997] 3 S.C.R. 1210, paras. 62-64 (Can.).

64. Id.

65. PHILIP H. OSBORNE, THE LAW OF TORTS 189 (3rd ed. 2007).

66. [1997] 3 S.C.R. 1210, paras. 68-69.

67. Sauer v. Canada (Att'y Gen.), 2007 ONCA 454, 225 O.A.C. 143, paras. 1, 14, 32 (Can. Ont. C.A.), leave to appeal denied, 256 O.A.C. 391 (Can.).

68. Id. para. 66.

69. Id. para. 42.

70. Id. para. 39.

71. Id.

72. The Gene Technology Regulator was created by the Gene Technology Act 2000 (Cth) s 26.

73. Perre v Apand Pty Ltd. (1999) 198 CLR 180, 180 (Austl.).

74. Perre v Apand Pty Ltd. (1997) 80 FCR 19, 23 (Austl).

75. Id.

76. Perre, 198 CLR at 205-06.

77. Id. at 239.

78. Id. at 205.

79. Justice Gummow said that the Perres' case "is best approached on the substantial footing that they do not complain of 'physical' damage to their land or the tangible assets used in their business operations there." Id. at 240.

80. Justice McHugh held that those of the Perre group who had only a packing and processing interest could not recover for pure economic loss, id. at 234-35, as did Justice Hayne, id. at 308.

81. See, e.g., Perre, 198 CLR at 195, 199-200, 219-23, 255-56, 289-90, 303; Caltex Oil Pty Ltd. v The Dredge "Willemstad" (1976) 136 CLR 529, 555, 592-93 (Austl.). Regarding Canada, see Cooper v. Hobart, 2001 SCC 79, [2001] 3 S.C.R. 537, para. 54 (Can.); Bow Valley Husky Ltd. v. Saint John Shipbuilding Ltd., [1997] 3 S.C.R. 1210, paras. 62-63 (Can.); Hercules Managements Ltd. v. Ernst & Young, [1997] 2 S.C.R. 165, paras. 31-41 (Can.); D'Amato v. Badger, [1996] 2 S.C.R. 1071, para. 18 (Can.); Winnipeg Condominium Corp. No. 36 v. Bird Constr. Co., [1995] 1 S.C.R. 85, para. 48 (Can.); Canadian Nat'l Ry. Co. v. Norsk Pac. Steamship Co., [1992] 1 S.C.R. 1021, 1176-77 (Can.). Regarding the United States, see Benson, supra note 24, at 832 (citing Fleming James, Jr., Limitations on Liability for Economic Loss Caused by Negligence: A Pragmatic Appraisal 43, 55 (1972)).

82. Perre, 198 CLR at 221.

83. Id. at 222, 303.

84. Stapleton, supra note 16, at 544-46.

85. Id. at 547.

86. As the Court held in McMullin v ICI Austl. Operations Pty Ltd. (1997) 72 FCR 1, 76 (Austl.).

87. See Dovuro Pty Ltd. v Wilkins (2000) 105 FCR 476, 485-86 (Austl.) (describing the vulnerable class, comprising the ultimate purchasers of contaminated seed, as limited and ascertainable).

88. Perre, 198 CLR at 222-23; Canadian Nat'l Ry. Co. v. Norsk Pac. Steamship Co., [1992] 1 S.C.R. 1021, 1176-77 (Can.); B.D.C. Ltd v. Hofstrand Farms Ltd., [1986] 1 S.C.R. 228, 229 (Can.).

89. For example, Justice Kirby in Perre noted there would be no duty owed to store owners in the local town or truckers who carried the potatoes elsewhere even though they lost income because of the contamination. Perre, 198 CLR at 289. See also id. at 222-23 (McHugh J).

90. See id. at 267.

91. See id. at 290, 307; Sauer v. Canada (Att'y Gen.), 2007 ONCA 454, 225 O.A.C. 143, paras. 62-65 (Can. Ont. C.A.), leave to appeal denied, 256 O.A.C. 391 (Can.); Hoffman v. Monsanto Can. Inc., 2007 SKCA 47, 293 Sask. R. 89. para. 60. (Can. Sask. C.A.), leave to appeal denied, [2007] 3 S.C.R. x.

92. McMullin v ICI Operations Pty Ltd. (No. 7) (1999) 169 ALR 227, 228-29, 234 (Austl.). No maximum residue level, or MRL, had been set for the insecticide internationally. Therefore meat with any of the insecticide present could be rejected by overseas markets. See McMullin v ICI Austl. Operations Pty Ltd. (1997) 72 FCR 1, 59-60, 80, 85 (Austl.).

93. All members of the Perre Court noted that finding the respondent liable in that case would not "derogate from its pursuit of its own commercial advantage." J.L.R. Davis, Liability for Careless Acts or Omissions Causing Pure Economic Loss: Perre v Apand Pty Ltd, 8 TORTS L. J. 123, 130 (2000). For a discussion of the concern regarding reluctance to interfere with legitimate pursuit of commercial interests and personal advantage, see also Perre, 198 CLR at 192-93, 200, 223-25, 283, 303; Woolcock Street Invs. Pty Ltd. v CDG Pty Ltd. (2004) 216 CLR 515, 548 (McHugh J) (Austl.); Bryan v Maloney (1995) 182 CLR 609, 618-19 (Austl.). For a discussion of commercial advantage in terms of "social loss" in Canadian law, see ALLEN M. LINDEN & BRUCE FELDTHUSEN, CANADIAN TORT LAW 444 (8th ed. 2006).

94. Brenda McGivern, Tortious Liability for (Selected) Genetic Harm: Exploring the Arguments, 10 TORTS L.J. 41, 60 (2002). See also Hill v Van Erp (1997) 188 CLR 159, 179, 192- 93, 215-16, 235-36 (Austl.) (opinions of Dawson J, Gaudron J, McHugh J, and Gummow J, respectively); Council of the Shire of Sutherland v Heyman (1985) 157 CLR 424, 502-03 (Austl.); Jaensch v Coffey (1984) 155 CLR 549, 578 (Austl.).

95. Perre, 198 CLR at 204, 225.

96. In Perre it was owed to the Sparnons. Perre, 198 CLR at 204.

97. But see Dalton, who concludes that the autonomy and freedom of actions of Australian commercializers would not be impaired by the imposition of a duty of care to neighbors because they are already under a "statutory obligation to guard against the risks of contamination." David Dalton, Transgenic Crops and Genetic Contamination: Assessing the Need for a Regulatory Response to Protect Organic Farmers, 8 AUSTRALASIAN J. OF NAT. RESOURCES L. & POL'Y 129, 152-53 (2003). It is not clear what the Australian statutory obligation is because the Gene Technology Act 2000 (Cth) does not impose such an "obligation."

98. Cane, supra note 33, at 260-61.

99. See Perre, 198 CLR at 219-20, 225. See also Dovuro Pty Ltd. v Wilkins (2000) 105 FCR 476, 486 (Austl.). In Dovuro, it was held that the defendant's behavior was not legitimately protecting or pursuing business interests. Id. at 486. Regarding Canada, see Hoffman v. Monsanto Can. Inc., 2007 SKCA 47, 293 Sask. R. 89, para. 60. (Sask. C.A.), leave to appeal denied, [2007] 3 S.C.R. x.

100. In re StarLink Corn Prods. Liab. Litig. (StarLink Litigation), 211 F. Supp. 2d 1060, 1062 (N.D. Ill. 2002); Perre, 198 CLR at 290, 307 (Judge Hayne and Judge Kirby noting, respectively, that this was an important factor in their decisions); Uchtmann, supra note 42, at 190-92, 201.

101. In re Genetically Modified Rice Litigation, 666 F. Supp. 2d 1004, 1019-20 (E.D. Mo. 2009); Gene Technology Act 2000 (Cth) ss 32, 33 (Austl.); Seeds Act, R.S.C. 1985, c. S-8 (Can.).

102. Esanda Fin. Corp. v Peat Marwick Hungerfords (1997) 188 CLR 241, 282 (McHugh J) (Austl.). See also discussion regarding insurance, infra Part II.

103. Hill v Van Erp (1997) 188 CLR 159, 199 (Austl.). Justice Gaudron noted that this was different to the factor of assumption of responsibility and reliance, control being in some respects a more stringent test. Id. at 198-99. Only Justice Gaudron pursued this factor as being significant. Justice McHugh in Perre referred to it as relevant, 198 CLR at 253-54, but none of the other members of the High Court has emphasized it.

104. See McMullin v ICI Austl. Operations Pty Ltd. (1997) 72 FCR 1, 82 (Austl.).

105. Cf. Woolcock Street Invs. Pty Ltd. v CDG Pty Ltd. (2004) 216 CLR 515, 550 (Austl.).

106. See Perre, 198 CLR at 213-14.

107. Id.

108. All members of the Perre Court considered plaintiff's vulnerability relevant although different interpretations were given to the term vulnerability. Id. at 194 (Gleeson CJ); id. at 259- 60 (Gummow J); Davis, supra note 93, at 130. See also Woolcock Street Invs. Pty Ltd. v CDG Pty Ltd. (2004) 216 CLR 515, 530-31 (Gleeson CJ, Gummow, Hayne and Heydon JJ). (Austl.). Justices Gaudron and McHugh in Perre also adopt the concept of special vulnerability of a plaintiffattracting a duty of care. Perre, 198 CLR at 201-02, 225-26. See also the judgment of Justices Toohey and Gaudron in Esanda Finance Corp. v Peat Marwick Hungerfords (1997) 188 CLR 241, 263-64 (Austl.).

109. See Stapleton, supra note 16, at 535.

110. Woolcock Street Invs. Ply Ltd., 216 CLR at 549.

111. In Perre, Justice McHugh said two things are important in this factor but they are not the only indicators of vulnerability. 198 CLR at 228. Justice Gleeson in Perre also referred to a vulnerability factor. Id. at 194. See also id. at 259 (Gummow J, with whom Gleeson CJ agreed, discussing the Perres' exposure to risk from the Apand experiment). Vulnerability was also emphasized by the High Court in Crimmins v Stevedoring Indus. Fin. Comm. (1999) 200 CLR 1, 24 (Austl.); Pyrenees Shire Council v Day (1998) 192 CLR 330, 335 (Austl.); Burnie Port Authority v General Jones Pty Ltd. (1994) 179 CLR 520, 551 (Austl.).

112. Adrian Baron, The "Mystery" of Negligence and Economic Loss: When is a Duty of Care Owed?, 19 AUSTL. BAR REV. 167, 194 (2000).

113. See id.

114. Id.

115. Id.

116. Perre, 198 CLR at 225. In Johnson Tiles, the findings of fact with respect to vulnerability were that there had been an uninterrupted supply in the past but all users were aware of the risk of interruption to the gas supply and could have taken steps to protect themselves such as by getting electric equipment, back-up generators or insurance. Johnson Tiles Pty Ltd. v Esso Austl. Pty Ltd. [2003] VSC 27, (2003) Aust Torts Reports ¶81-692, para. 1040.

117. Cane, supra note 33, at 251.

118. See Dalton, supra note 97, at 152 (concluding that the surrounding farmers were vulnerable).

119. Charles Lawson, Risk Assessment in the Regulation of Gene Technology under the Gene Technology Act 2000 (Cth) and the Gene Technology Regulations 2001 (Cth), 19 ENVTL. & PLAN. L.J. 195, 197-98 (2002).

120. See, e.g., R v. Sec'y of State for the Env't ex parte Watson, [1999] Env. L.R. 310 at 311 (Eng.).

121. Jane Stapleton, Tort, Insurance and Ideology, 58 MOD. L. REV. 820, 825 (1995).

122. Id. at 825-26.

123. On the facts of Perre, Justice McHugh held there was nothing the plaintiffs could have done to protect themselves. Perre v Apand Pty Ltd. (1999) 198 CLR 180, 236 (Austl).

124. See, e.g., Bow Valley Husky Ltd. v. Saint John Shipbuilding Ltd., [1997] 3 S.C.R. 1210, paras. 68-69 (Can.).

125. See e.g., Johnson Tiles Pty Ltd. v Esso Austl. Pty Ltd. [2003] VSC 27, (2003) Aust Torts Reports ¶81-692, paras. 1013, 1110 (Austl.) (finding the plaintiff's lack of backup power sources relevant to the existence of a duty). See also Heeney v. Best (1979), 28 O.R. 2d 71, 73-74 (Can. Ont. C.A.), where plaintiff's failure to install an auxiliary generator by an electricitydependant firm was treated as contributory negligence.

126. See John G Fleming, Tort in a Contractual Matrix, 3 TORT L. REV. 12, 24 (1995).

127. As Justice McHugh has said, "[t]he degree and the nature of vulnerability sufficient to found a duty of care will no doubt vary from category to category and from case to case." Perre, 198 CLR at 229.

128. Id. at 236.

129. Id. at 236, 259.

130. Id. at 331. See generally id. at 326-29 (Callinan J, discussing the vulnerable position of the Perres and the potential impact an act by Apand Pty Ltd. may have on them).

131. Id. at 236, 259.

132. Bow Valley Husky Ltd. v. Saint John Shipbuilding Ltd., [1997] 3 S.C.R. 1210, paras. 68-69 (Can.).

133. See Stapleton, supra note 121, at 829-30.

134. Perre, 198 CLR at 230. Cf. Johnson Tiles Pty Ltd. v Esso Austl. Pty Ltd. [2003] VSC 27, (2003) Aust Torts Reports ¶81-692, paras. 1101-03 (Austl.) (finding that the availability of insurance to the plaintiffcan negate vulnerability as a factor because it offers a reasonable way for the plaintiffto protect himself). See also Caltex Oil Pty Ltd. v The Dredge "Willemstad" (1976) 136 CLR 529, 580 (Austl.), where the plaintiffcould have anticipated its loss and allowed for it by purchasing insurance. The High Court did not take insurance into account in that case. Id. at 581. Justice Stephen, in fact, expressly rejected the relevance of insurance. Id. at 580-81. On this holding of Caltex, see generally J.A. Smillie, Negligence and Economic Loss, 32 U. TORONTO L.J. 231 (1982).

135. Regarding availability of insurance, it has been noted that "producers, growers and those who may suffer accidental contamination may find difficulty in obtaining adequate insurance to cover

damages in the event that they are held liable another [sic] person's loss." PARLIAMENT OF TASMANIA, JOINT SELECT COMMITTEE REPORT ON GENE TECHNOLOGY 109 (2001) (Austl.) [hereinafter TASMANIA COMMITTEE REPORT]. While not clear, it seems the Committee intended to point out that it would be difficult for commercializers (that is, those that may be liable for another's loss) to get insurance rather than how difficult it would be for plaintiffs to get the same.

136. Perre, 198 CLR at 226. See also Hill v Van Erp (1997) 188 CLR 159, 184 (Austl.).

137. Khoury & Smyth, supra note 29, at 223.

138. See Perre, 198 CLR at 192, 226 (Gleeson CJ and McHugh J discussing the importance of pre-existing regulations when determining whether to impose a duty of care); Sullivan v Moody (2001) 207 CLR 562, 580 (Austl.).

139. Johnson Tiles, [2003] VSC 27, (2003) Aust Torts Reports ¶81-692, para. 1171 (Austl.).

140. Sullivan, 207 CLR at 582 (Gleeson CJ, Gaudron, McHugh, Hayne, and Callinan JJ) (Austl.).

141. See Dovuro Pty Ltd. v Wilkins (2000) 105 FCR 476, 529-30 (Austl.) (Gyles J, dissenting) (noting that unlike in Perre, "the seed species were not prohibited or regulated anywhere in Australia or by the OECD system at the time the seed was supplied").

142. See id. at 486-87 (noting that finding a duty of care to warn of contamination would not interfere with the law governing the sale of goods generally).

143. See Woolcock Street Invs. Pty Ltd. v CDG Pty Ltd. (2004) 216 CLR 515, 561-62 (Kirby J) (Austl.).

144. FRANCIS TRINDADE & PETER CANE, THE LAW OF TORTS IN AUSTRALIA 352 (3d ed. 1999).

145. Sauer v. Canada (Att'y Gen.), 2007 ONCA 454, 225 O.A.C. 143, para. 66 (Can. Ont. C.A.), leave to appeal denied, 256 O.A.C. 391 (Can.).

146. See, e.g., Sample v. Monsanto Co., 283 F. Supp. 2d 1088, 1093 (E.D. Mo. 2003).

147. A. Bryan Endres, "GMO:" Genetically Modified Organism or Gigantic Monetary Obligation? The Liability Schemes for GMO Damage in the United States and the European Union, 22 LOYOLA L.A. INT'L & COMP. L. REV. 453, 485 (2000).

148. Ramiro Iturrioz, The World Bank, Agricultural Insurance, PRIMER SERIES ON INS., Nov. 2009, at 2-3, available at

http://siteresources.worldbank.org.ezproxy.lib.monash.edu.au/FINANCIALSECTOR/Resources/Primer12_Agricultural_Insurance.pdf.

149. Id. at 7-9.

150. Causes of Loss, SASK. CROP INS. CORP, http://www.saskcropinsurance.com/Default.aspx?DN=66a238c0-43ca-4982-8801-63c68ec5fb76 (last visited July 16, 2011).

151. Tom Baker, Insurance and the Law 1-2 (Univ. of Conn. Sch. Of Law Articles & Working Papers, Paper No. 5, 2002), available at http://lsr.nellco.org/cgi/viewcontent.cgi?article=1004&context=uconn_wps.

152. See Ralph H. Blanchard, Compulsory Motor Vehicle Liability Insurance in Massachusetts, 3 LAW & CONTEMP. PROBS. 537, 538 (1936).

153. R.P. BALKIN & J.L.R. DAVIS, LAW OF TORTS 12 (4th ed. 2008).

154. Robert Uhlig, Thalidomide Warning by Insurers Who Refuse GM Crops Cover, DAILY TELEGRAPH (London), Oct. 8, 2003, at 12.

155. OFF. OF THE GENE TECH. REGULATOR, http://www.ogtr.gov.au/ (last modified Mar. 30, 2009).

156. Australian GM Status by States, NETWORK OF CONCERNED FARMERS (Apr. 15, 2004), http://www.non-gm-farmers.com/news_details.asp?ID=1212.

157. Gene Technology (GM Crop Moratorium) Act 2004 (ACT) s 6 (Austl.); Gene Technology (GM Crop Moratorium) Act 2003 (NSW) s 3 (Austl.); Genetically Modified Crops Management Act 2004 (SA) pmbl. (Austl.); Control of Genetically Modified Crops Act 2004 (Vic) s 1 (Austl.); Genetically Modified Crops Free Areas Act 2003 (WA) pmbl. (Austl.).

158. See Fact Sheet, OFF. OF THE GENE TECH. REGULATOR (Dec. 2008), http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/content/gmofactsheets-3/$FILE/gmstockfeed.pdf.

159. The authors thank Dr. Alan McHughen, CE Biotechnology Specialist and Geneticist, University of California, Riverside, for making this point in our conversation of November 29, 2011.

160. A.C. PIGOU, THE ECONOMICS OF WELFARE 172-203 (4th ed. 1932).

161. HERMAN E. DALY & JOSHUA FARLEY, ECOLOGICAL ECONOMICS: PRINCIPLES AND APPLICATIONS 430 (2d ed. 2010).

162. Id.

163. Acreage and Percentage of HT and Conventional Canola in Canada, CANOLA COUNCIL OF CAN., http://www.canolacouncil.org/ht_conventional_estimates.aspx (last visited Dec. 3, 2011); Provincial Acreage and Yield, CANOLA COUNCIL OF CAN., http://www.canola council.org/acreageyields.aspx (last visited Dec. 3, 2011).

164. JAMES, supra note 9, at 20-21.

165. GM Cotton in Australia: A Resource Guide, AGRIFOOD AWARENESS AUSTRALIA (Feb. 2009), http://www.afaa.com.au/resource_guides/Resource_Cotton2.pdf.

166. Pareto Improvements and Kaldor-Hicks Efficiency Criterion, RECKON (Dec. 14, 2010, 4:50 PM), http://www.reckon.co.uk/open/Pareto_improvements_and_Kaldor-Hicks_efficiency_ criterion.

167. For further details about the Kaldor-Hicks criteria, see id.

168. Id.

169. Denmark has done this through the adoption of the Danish Act on the Growing etc. of Genetically Modified Crops. The Act taxes adopters and the revenue pool is used to compensate other farmers that can prove they have been adversely affected. ACT ON THE GROWING ETC. OF GENETICALLY MODIFIED CROPS, act no. 436 §§ 9(1), 12(1) (Den.).

170. The Compact, CROPLIFE INT'L, http://www.croplife.org/public/the_compact (last visited Oct. 17, 2011).

171. For a more detailed assessment of this, see SMYTH ET AL., supra note 39, at 42-45.

172. JULIAN M. ALSTON ET AL., SCIENCE UNDER SCARCITY: PRINCIPLES AND PRACTICES FOR AGRICULTURAL RESEARCH AND PRIORITY SETTING 77 (1998).

173. Julian M. Alston & Brian H. Hurd, Some Neglected Social Costs of Government Spending in Farm Programs, 72 AM. J. AGRIC. ECON. 149, 149 (1990).

174. Don Fullerton, Reconciling Recent Estimates of the Marginal Welfare Cost of Taxation, 81 AM. ECON. REV. 302, 302 (1991).

175. Alexander J. Stein & Emilio Rodríguez-Cerezo, International Trade and the Global Pipeline of GM Crops, 28 NATURE BIOTECHNOLOGY 23, 24 (2010).

176. A. I. Ogus & G. M. Richardson, Economics and the Environment: A Study of Private Nuisance, 36 CAMBRIDGE L.J. 284, 324 (1977). Such costs include prevention of the introduction of GM technology.

177. For a discussion of whether the courts or government are better suited to making such decisions, see generally David Campbell, Of Coase and Corn: A (Sort of) Defence of Private Nuisance, 63 MOD. L. REV. 197 (2000).

178. Lov nr. 436 af 9.6.2004 om dyrkning m.v. af genetisk modificerede afgrøder [Act on the Growing etc. of Genetically Modified Crops, No. 436 of June 9, 2004] § 9 (Den.), available at http://retsinformation.w0.dk/Forms/R0710.aspx?id=8035, translated in http://www.naturschutzrecht. net/Gentechnik/GenTG_DK.pdf.

179. Cane suggests these with respect to environmental harms generally. Peter Cane, Are Environmental Harms Special?, 13 J. ENVTL. L. 3, 12-13 (2001).

180. Id. at 12.

181. There are other options for prevention other than non-adoption, including the use of buffer zones and other segregation techniques. Dep't of Human Servs., Gov't of S. Austl., Preserving the Identity of non-GM Crops in South Australia, SA HEALTH, 18 (Sept. 2001). The regulatory review in all jurisdictions requires strategies for mitigation prevention. Nevertheless, there may still be cases where even with the use of these, markets refuse to accept non-adopters' products.

182. The Organic Federation of Australia has suggested exactly this, arguing that GM crop licenses should not be issued if contamination of neighboring GM-free crops may occur. See TASMANIA COMMITTEE REPORT, supra note 135, at 86.

183. One unapproved variety was LLRICE 601, the subject of the litigation in In re Genetically Modified Rice Litigation, 666 F. Supp. 2d 1004, 1014, 1016 (E.D. Mo. 2009). LLRICE 601 was subsequently approved in November 2006. Id. at 1015 n.2.

184. The European Commission has adopted a 0.1% threshold for unauthorized GM material in imported animal feed. Commission Regulation 619/2011, 2011 O.J. (L 166) 15; Rules on GMOs in the EU-Harmonization of Controls, EUROPEAN UNION, http://ec.europa.eu/food/food/ biotechnology/harmonisation_of_controls_en.htm (last visited Nov. 14, 2011).

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