Upholding the Human Right to Food in the Face of Agro-Biofuel Technology

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For centuries, fossil fuels have monopolized the energy market. Seeking greener, renewable energy sources, nations have recently turned to agro-biofuels. This article will focus on first generation agro-biofuel technology, and argue that this technology undermines the fulfillment of the human right to food both directly and indirectly. The first section will canvass the issues that arise at the intersection of the energy, agriculture and food industries with agro-biofuel technology at its core. In particular, this section will highlight various factors that support the premise that the right to food should be prioritized over the application of agro-biofuel technology. The second section will propose an international regulatory regime that would dictate whether a given jurisdiction would be permitted to engage in the practice of agro-biofuel technology. Finally, the proposed framework will be applied to the Canadian context.

Les combustibles fossiles monopolisent le marché de l'énergie depuis des siècles. À la recherche de sources d'énergie vertes et renouvelables, les pays se tournent dès lors vers les biocarburants d'origine agricole. Cet article porte essentiellement sur la technologie de première génération permettant de produire des biocarburants à partir de matières agricoles et soutient que ce type de technologie nuit directement et indirectement à la réalisation du droit à l'alimentation. La première partie examine diverses questions qui surgissent et se recoupent à l'intersection des industries de l'énergie, de l'agriculture et de l'alimentation, et au cœur desquelles se trouve l'industrie des biocarburants. Elle met surtout en preuve les divers facteurs qui appuient la prémisse voulant que le droit à l'alimentation doit primer sur l'usage de la technologie pour produire des biocarburants d'origine agricole. La deuxième partie propose un régime de réglementation international pouvant autoriser ou non un pays ou un territoire donné à pratiquer l'agriculture pour produire des biocarburants. Enfin, on examine l'application du cadre proposé au contexte canadien.

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I. Introduction

The term agriculture invokes picturesque images of farmers cultivating land and passing on their know-how from one generation to the next. Those days are long gone. Corporate and government actors have long since entered the once traditional practice of agriculture,[1] and have transformed it into a commercial endeavour and a highly scientific undertaking. The energy industry, once heavily dependent upon fossil fuels, has entered the agricultural market. In order to meet rising energy consumption demands of the world's growing population and mitigate potential threats to energy security,[2] both the public and private energy sectors have turned their attention to agricultural land as an alternative natural energy source to meet energy requirements.[3] The rate at which fossil fuel reserves are being depleted and the ever-present environmental concerns associated with fossil fuel use, including greenhouse gas emissions, global warming and climate change, are driving the research, development and adoption of biofuel technology in jurisdictions throughout the world.[4] As an alternative to fossil fuels, "[b]iofuels have captured considerable attention because of the relative abundance of feedstock in all regions, their easy utilization in combustion engines for transportation, compatibility with existing fuel distribution infrastructure and because they can provide a new end market for agricultural commodities, therefore, revitalizing rural areas."[5]

This article will concentrate its analysis on agricultural biofuel technology practices (hereinafter, agro-biofuel technology). Biofuel, a subcategory of bioenergy, is defined as "energy produced from organic matter or biomass".[6] At present, ethanol and biodiesel[7] are the predominant

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[1] "Together with the financial crisis, the boom led to a "rediscovery" of the agricultural sector by different types of investors". Klaus Deiniger et al, *Rising Global Interest in Farmland: Can it Yield Sustainable and Equitable Benefits?* (Washington, DC: The World Bank, 2011) at 1, online: <siteresources.worldbank.org/DEC/Resources/Rising-Global-Interest-in-Farmland.pdf>.

[2] Office of Policy Analysis, "World Biofuels Production Potential: Understanding the Challenges to Meeting the U.S. Renewable Fuel Standard" in Thomas E Rommer, ed, *World Biofuels Production Potential* (New York: Nova Sciences Publishers, Inc, 2010) 37 at 41.

[3] "With world energy consumption predicted to increase to 54 % between 2001 and 2025, considerable focus is being directed toward the development of sustainable and carbon neutral energy sources to meet the future needs." Veeranjaneya Reddy Lebaka, "Potential Bioresources as Future Sources of Biofuels Production: An Overview" in Vijai Kumar Gupta & Maria G Tuohy, eds, *Biofuel Technologies: Recent Developments* (Heidelberg, NY: Springer, 2013) 223 at 224.

[4] Gregory Zaimes, Matthew Borkowski & Vikas Khanna, "Life-Cycle Environmental Impacts of Biofuels and Co-products" in Gupta & Tuohy, *supra* note 3, 471 at 471.

[5] James G Speight & Kamel Singh, *Environmental Management of Energy from Biofuels and Biofeedstocks* (Salem, MA: Scrivener Publishing, 2014) at 160.

[6] Gawdat Bahgat, *Energy Security: An Interdisciplinary Approach* (Chichester: John Wiley & Sons, 2011) at 10.

[7] "Ethyl alcohol, or ethanol, can be produced from feedstock that contains relatively dense quantities of sugar or starchy crops…Biodiesel is based on vegetable oils" (*ibid* at 10).

liquid biofuels and are"derived from agricultural, forest or any other organic material (feedstock)."[8] Biofuels can be classified based on the substrate or biological material targeted for conversion.[9] Primary biofuels can be made from firewood, woodchips, pellets, animal waste, forest and crop residue, and landfill gas. Secondary biofuels can be subdivided by substrate into three generations: the first generation can be made from seeds, grains and sugars,[10] the second generation from lignocellulosic biomass,[11] and the third generation using algea and sea weeds.

Currently, biofuel technology research and development has tended to focus on first generation biofuels at the expense of second-generation biofuels. Second generation biofuels "could avoid many of the concerns facing 'first generation biofuels'",[12] but nonetheless, considerable profitability barriers to the use of second-generation biofuel technology remain.[13] This article will therefore focus on first generation biofuels.

Interestingly agro-biofuel technology is not a nascent technology of our time but rather its roots go back to the nineteenth and early twentieth centuries. In the 1820s, American inventor Samuel Morey used ethanol, a first generation agro-biofuel derivative, in the first internal combustion engine chamber.[14] Henry Ford, the twentieth century pioneer in the automobile industry, announced in an article published by *The New York Times* in 1925 that

> [t]he fuel of the future...is going to come from fruit like that sumac out by the road, or from apples, weeds, sawdust—almost anything. There is fuel in every bit of vegetable

[8] Speight & Singh, *supra* note 5 at 159–60.

[9] Lebaka, *supra* note 3 at 225.

[10] "First generation biofuels, also known as conventional biofuels, are derived from sugar, starch, animal fats, and plant or vegetable oils…First generation biofuels are typically produced from the fermentation of grains and crops with a high sugar or starch content, such as corn, sugarcane, sugar beats, wheat, or barley to produce bio-ethanol, or by transesterification of oils extracted from crops such as soybean, rapeseed, canola, mustard seed, palm, coconut, and sunflower to create biodiesel." Zaimes, Borkowski & Khanna, *supra* note 4 at 474–75.

[11] "[S]econd generation bio-fuels are derived from forest and agricultural residues, lignocellulosic biomass, industrial wastes, and nonfood crop feedstocks.…Common biochemical pathways for second generation biofuels include the use of pretreatments, such as enzymes and microorganisms, to break down and extract the sugars contained in lignocellulosic biomass, which can then be fermented to produce ethanol and other alcohols." *Ibid* at 475–76.

[12] Bahgat, *supra* note 6 at 11.

[13] "Besides, technical challenges discussed above, costs of production is another main challenge for commercialization of second generation biofuels. Currently, the cost of fuel ethanol produced from lignocellulosic materials is much higher not only than gasoline but also than corn- or sugarcane-based ethanol, mainly because of the more complicated processing associated with the lignocellulosic ethanol production." Govinda R Timilsina & Jay J Cheng, "Advanced Biofuel Technologies: Status and Barriers" (2010) The World Bank Working Paper 5411 at 19–21. See also Miguel A Carriquiry, Xiaodong Du & Govinda R Timilsina, "Second Generation Biofuels: Economics and Policies" (2011) 39:7 Energy Policy 4222.

[14] World Watch Institute, *Biofuels For Transportation: Global Potential and Implications for Sustainable Energy and Agriculture* (London: Earthscan, 2007) at 3, online: <base.dnsgb.com.ua/files/book/Agriculture/Biotechnology-Renewable-Energy/Biofuels-for-Transport-Global-Potential.pdf>.

> matter that can be fermented. There's enough alcohol in one year's yield of an acre of potatoes to drive the machinery necessary to cultivate the field for a hundred years.[15]

Ford's foreshadowing was realized in the twenty-first century. The historical event that tipped the scales in favour of agro-biofuel technology development and adoption was the oil crisis of the 1970s.[16] Until this time, conventional fossil fuels were available, abundant and cheap resources that flooded the world's energy market. Shaken by the crisis, many countries sought to find energy alternatives to lessen, and eventually completely eliminate, their dependence on petroleum fuel imports.[17] In particular, Brazil and the United States embarked on ethanol promotion and production programs, transforming feedstock, primarily corn, into biofuels whose compositional and combustion properties are akin to that of petroleum fuel. As a result, both Brazil and the United States have secured world market shares of ethanol production of 47.9 per cent and 41.1 per cent respectively.[18] While the "United States and Brazil dominate the current liquid biofuel industry",[19] Canada, Australia, and Europe are actively considering incorporating biofuel technology into their prospective energy strategies.[20]

Canada, a late adopter and promoter of the biofuel revolution, ranked fifth in biofuel production in 2006 with a discrete 1.4% market share.[21] Despite its significant lag in market position, Canadian governments at both the provincial and federal levels have implemented policies encouraging a larger biofuel energy portfolio. The federal government has demonstrated its particular interest in biofuel technology through the adoption of renewable energy policies. Examples of these policies include the *Renewable Fuel Regulation* of 2010,[22] as well as the promotion of biofuel via incentive programs, namely the ecoENERGY for Biofuel Program[23] that has allocated $1.5 billion over the course of a nine-year period in support of biofuel production in Canada".[24]

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[15] L Leon Geyer, Phillip Chong & Bill Hxue, "Ethanol, Biomass, Biofuels and Energy: A Profile and Overview" (2007) 12:1 Drake J Agric L 61 at 61.

[16] World Watch Institute, *supra* note 14 at 5.

[17] C Ford Runge & Benjamin Senauer, "How Biofuels Could Starve the Poor" (2007) 86:3 Foreign Affairs 41 at 41.

[18] World Watch Institute, *supra* note 14 at 6.

[19] Bahgat, *supra* note 6.

[20] *Ibid*.

[21] World Watch Institute, *supra* note 14 at 6.

[22] *Renewable Fuel Regulation*, SOR/2010-189.

[23] Natural Resources Canada, "ecoENERGY for Biofuels Program" (24 April 2014), online: <www.nrcan.gc.ca/energy/alternative-fuels/programs/12358>.

[24] Natural Resources Canada, "ecoENERGY for Biofuels Program", online: Natural Resources Canada <www.nrcan.gc.ca/energy/alternative-fuels/programs/ecoenergy-biofuels/3607>: "[i]n December 2006, the Government of Canada announced its intent to develop federal regulations on renewable fuels. These proposed regulations will require five percent renewable fuel content based on the gasoline pool by 2010".

Often, the regulatory regimes that promote the adoption of biofuel technology champion its "green technology" characteristics. While environmental objectives are front and centre in the discourse surrounding biofuels, specifically biofuel's proclaimed ability to reduce greenhouse gas emissions and potentially be an indefinitely renewable energy source, such a dialogue overshadows a variety of other concerns related to the present use and development of agro-biofuel technology. This article will focus on one of those other concerns, namely the nexus between the human right to food and the pursuit of energy security through agro-biofuel technology practices, and will demonstrate that these two seemingly distinct spheres are in fact estranged bedfellows.

This article is structured as follows. The first section will investigate the consequences of the use of agro-biofuel technology on the cultivation of human food stock. This investigation will focus upon three specific areas of analysis, namely the effect that the production of agro-biofuel has on the use of land (including the phenomena of the global land acquisitions and land use change), the worrisome impact on food prices, and its impact on climate change and greenhouse gas emissions. This section will conclude that harmonizing the coexistence of food for fuel and food for human consumption is unachievable and undesirable when agro-biofuel technology poses an imminent threat to the human right to food.

In response to the conclusions of the first section, the second section of this article will propose an international regulatory regime grounded in the Organization for Economic Cooperation and Development (OECD) Integrated Checklist.[25] This checklist provides succinct guidelines for a techno-policy driven analysis concerning agro-biofuel technology. This framework would enable states to determine whether they would be precluded from engaging in agro-biofuel technology practices within a jurisdiction, be it foreign or domestic. Lastly, the framework will be applied to the Canadian context, concluding that Canada should not be permitted to engage in agro-biofuel technology as it poses an imminent threat to the realisation of the right to food of many Canadians.

II. Land Use Changes and their Consequences

The human right to food is generally defined as

> [t]he right to have *regular, permanent and unrestricted access*, either directly or by means of financial purchases, to quantitatively and qualitatively adequate and sufficient

[25] Organisation for Economic Co-operation and Development, "The OECD Reference Checklist for Regulatory Decision-Making", online: <www.oecd.org/gov/regulatory-policy/35220214.pdf> [OECD Checklist].

> food *corresponding to the cultural traditions* of the people to which the consumer belongs, and which ensure a physical and mental, individual and collective, fulfilling and dignified life free of fear.[26]

This right has been recognized in international law, being "articulated in article 25(1) of the *Universal Declaration of Human Rights* and codified in article 11 of the *International Covenant on Economic, Social and Cultural Rights*".[27] Moreover, the right to food has been declared "a *fundamental* human right in international human rights law and is to be given the *highest priority* both in national and international policies regarding food and agriculture."[28] The established primacy of the human right to food is rooted in its indivisibility from "the inherent dignity of the human person"[29] and its indispensability "for the fulfilment of other human rights enshrined in the International Bill

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[26] OHCHR, "Special Rapporteur on the Right to Food", online: <www.ohchr.org/EN/Issues/Food/Pages/FoodIndex.aspx> [emphasis added]. Various other international bodies, alongside the OHCHR's Special Rapporteur, have also defined the right to food. See Federica Donati & Margret Vidar, "International Legal Dimensions of the Right to Food" in George Kent, ed, *Global Obligations for the Right to Food* (Lanham, MD: Rowman & Littlefield Publishers, 2008) 47. Donati and Vidar argue the Committee on Economic, Social and Cultural Rights has also defined the human right to food as "[t]he right to adequate food is realized when every man, woman and child, alone or in community with others, has physical and economic access at all times to adequate food or means for its procurement." (*ibid* at 51).

[27] Canadian Food Security Policy Group, "A Food Security Perspective on Canada's International Trade and Development Assistance Policies: A Discussion Paper for the Government of Canada's International Policy Review" at 4, online: Centre for Human Settlements, University of British Columbia <www.chs.ubc.ca/archives/files/A%20Food%20Security%20Perspective%20on%20Canada's%20International%20Trade%20and%20Development%20Assistance%20Policies.pdf>.
Article 25(1) of the *Universal Declaration of Human Rights* reads: "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food…" *Universal Declaration of Human Rights*, GA Res 217A (III), UNGAOR, 3rd Sess, Supp No 13, Un Doc A/810 (1948) 71, at art 25(1) [UDHR];
Article 11(2) of the *International Covenant on Economic, Social and Cultural Rights* reads: "The States Parties to the present Covenant, recognizing the fundamental right of everyone to be free from hunger, *shall take, individually and through international co-operation*, the measures, including specific programmes, which are needed: (a) *To improve methods of production, conservation and distribution of food* by making full use of technical and scientific knowledge, by disseminating knowledge of the principles of nutrition and by *developing or reforming agrarian systems in such a way as to achieve the most efficient development and utilization of natural resources*; (b) Taking into account the problems of both food-importing and food-exporting countries, *to ensure an equitable distribution of world food supplies in relation to need*." *International Covenant on Economic, Social and Cultural Rights*, 16 December 1966, 993 UNTS 3 art 11(2) (entered into force 3 January 1976) [*ICESCR*] [emphasis added].

[28] Absjørn Eide, *The Right to Food and the Impact of Liquid Biofuels* (Rome: Food and Agriculture Organization of the United Nations, 2008) at 6, online: <www.fao.org/docrep/016/ap550e/ap550e.pdf> [emphasis added]; See also Hans Morten Haugen, "The Right to Food, the Right to Benefit From Science and the TRIPS Agreement" in Wenche Barth Eide & Uwe Kracht, eds, *Food and Human Rights in Development: Legal and Institutional Dimensions and Selected Topics*, vol 1 (Antwerpen: Intersentia, 2005) 425. Haugen states that "the right to food the only human right which is in the *International Covenant on Economics, Social and Cultural Rights* (*ICESCR*), has been defined as a fundamental right (Article 11.2), and which therefore must be given the highest priority." (*ibid*).

[29] *Substantive Issues Arising in the Implementation of the International Covenant of Economic, Social and Cultural Rights: The Right to Adequate Food (art 11)*, UNESCOR, 20th Sess, General Comment 12, E/C 12/1999/5 1 at 2, online: FAO <www.fao.org/fileadmin/templates/righttofood/documents/RTF_publications/EN/General_Comment_12_EN.pdf> [FAO, *Substantive Issues*].

of Human Rights."[30] More importantly, undernourishment of the world's population has persisted for centuries and is a recurring motivation for the international movement to eradicate world hunger.[31] The Food and Agriculture Organization of the United Nations (FAO) has estimated that, between 2011 and 2013, 842 million individuals "were not able to meet their dietary energy requirements"[32] and that "around one in eight people in the world are likely to have suffered from chronic hunger, not having enough food for an active and healthy life."[33]

In addition to the concerns regarding a growing population, other considerations such as urbanization, changing consumption patterns and climate change are also key variables playing into the rising concerns over achieving food security:

> The global population will continue to grow, yet it is likely to plateau at some 9 billion people by roughly the middle of this century. A major correlate of this deceleration in population growth is increased wealth, and with higher purchasing power comes higher consumption and a greater demand for processed food, meat, dairy, and fish, all of which add pressure to the food supply system. *At the same time, food producers are experiencing greater competition for land, water, and energy, and the need to curb the many negative effects of food production on the environment is becoming increasingly clear. Overarching all of these issues is the threat of the effects of substantial climate change and concerns about how mitigation and adaptation measures may affect the food system*.[34]

Analogous to the human right to food is the concept of food security. A useful working definition of food security provided by the FAO is "[f]ood security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life."[35] The UN High Commissioner for Human Rights has explained that food security is "a precondition for the full enjoyment of the right to food"[36] and established

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[30] *Ibid*.

[31] See e.g. United Nations, "We Can End Poverty: Millennium Development Goals and Beyond 2015" (2013), online: <www.un.org/millenniumgoals/pdf/Goal_1_fs.pdf>; See also FAO, International Fund for Agricultural Development & United Nations World Food Programme, *The State of Food Insecurity in the World 2013: The Multiple Dimensions of Food Security* (Rome: Food and Agricultural Organization of the United Nations, 2013), online: <www.fao.org/docrep/018/i3434e/i3434e.pdf> [FAO, IFAD & WFP].

[32] FAO, IFAD & WFP, *supra* note 31 at 8.

[33] *Ibid*.

[34] H Charles J Godfray et al, "Food security: The Challenge of Feeding 9 Billion People" (2010) 327:5967 Science 812 at 812 [emphasis added]. See also Deiniger, *supra* note 1 at 13–14. Deiniger argues that "[e]xperts agree that population growth, rising incomes, and urbanization will continue to drive demand growth for some food, especially vegetable oils and livestock, with higher derived demand for feed and for industrial products. To cope with a 40 percent increase in world population, production would need to rise by 70 percent, and raising food consumption to 3,130 kcal/person/day by 2050 would require agricultural production to nearly double in developing countries."

[35] FAO, "Trade Reforms and Food Security: Conceptualizing the Linkages", (2003) at 29, online: <ftp.fao.org/docrep/fao/005/y4671e/y4671e00.pdf>.

[36] UNOHCHR, *The Right to Adequate Food*, Human Rights Fact Sheet No 34 (Geneva: OHCHR, 2010) online: <www.ohchr.org/Documents/Publications/FactSheet34en.pdf> at 4.

its four constituent components.[37] Logically, if these components are not satisfied, the result is food *in*security. The first requirement for achieving a state of food security is the physical availability of food. This requirement specifically "addresses the 'supply side' of food security and is determined by the level of food production, stock levels and net trade."[38] It is a reference to "when food is *available* from domestic production, imports, or as food aid".[39] The second requirement is the economic, physical and social access to food, which is established "when there is *access* to food from household production, local markets, or public support networks".[40] It is important to note that "[a]n adequate supply of food at the national or international level does not in itself guarantee household level food security."[41] Third is the food utilization requirement that refers to "the way the body makes the most of various nutrients in the food."[42] In other words, it is "when *quality* of food is healthy and nutritious."[43] The third dimension is measured in particular by investigating "feeding practices, food preparation, *diversity of the diet* and intra-household distribution of food."[44] Lastly, the fourth requirement of food security is stability. Stability is "when each of [the above-mentioned] factors are *stable throughout the year*."[45] "Adverse weather conditions, political instability, or economic factors (unemployment, rising food prices)"[46] are variables to be considered in determining whether the other three components, namely physical availability, economical, physical and social access, and food utilization, are stable throughout the calendar year. Food security is realized when all four constitutive pillars are simultaneously attained.[47]

Legal definitions and food security requirements aside, it has been contended that agro-biofuel technology is a means of securing a viable, environmentally "friendly" and renewable energy source that can sustainably coexist with traditional agricultural practices for food thus fulfilling and not hindering state obligations stemming from the right to food.[48] This premise is expressed in the implementation of policies and initiatives related to agro-

[37] FAO, "Food Security Information for Action Practical Guides: An Introduction to the Basic Concepts of Food Security" (2008), online: <www.fao.org/docrep/013/al936e/al936e00.pdf> [FAO, "Food Security"].
[38] *Ibid*.
[39] Canadian International Development Agency, "Increasing Food Security: CIDA's Food Security Strategy" at 1, online: Canadian International Development Agency < http://www.international.gc.ca/development-developpement/assets/pdfs/food-security-strategy-e.pdf> [CIDA] [emphasis added].
[40] *Ibid* [emphasis added].
[41] FAO, "Food Security", *supra* note 37 at 1.
[42] *Ibid*.
[43] CIDA, *supra* note 39 at 1 [emphasis added].
[44] FAO, "Food Security", *supra* note 37 at 1 [emphasis added].
[45] CIDA, *supra* note 39 at 1 [emphasis added].
[46] FAO, "Food Security", *supra* note 37 at 1.
[47] *Ibid*.
[48] Christine Moser, Tina Hildebrandt & Robert Bailis, "International Sustainability Standards and Certification" in Barry D Solomon & Robert Bailis, eds, *Sustainable Development of Biofuels in Latin America and the Caribbean* (New York: Springer, 2014) 27 at 30–37.

biofuels. However, this article argues the contrary, namely that the adoption of agro-biofuel technologies presents insurmountable impediments to ensuring that the fundamental right to food is met.

A. Two Concerns from the Global Land Rush

A nexus between agriculture for food crops and agriculture for agro-biofuel crops is land; without land neither practice would be possible. Olivier de Schutter, then UN Special Rapporteur on the Right to Food, argued that "the right to land may be said to be instrumental to the right to food: it is protected as an indispensable means through which people can produce food, for their own consumption or as a source of income allowing them, in turn, to purchase food."[49] As such, land and the implementation of the right to food are explicitly and intrinsically linked.[50] The international legal foundation of this link can be traced to article 11(2) of the *ICESCR* that "enumerates among measures to be undertaken by States parties regarding the right to food, a duty to 'improve methods of production, conservation and distribution of food … *by developing or reforming agrarian systems*'".[51] However, increasingly fierce competition over land, driven notably by the agro-biofuel industry in the last few decades, poses an imminent threat to the fulfillment of the right to food.

Interestingly, the competition for land is not confined to cultivating food for human consumption or agro-biofuel crops. Rather, in some jurisdictions, the dedication of land for the cultivation of livestock feed crops, also referred to as animal feed, is another added stressor[52] resulting in a three-fold food-feed-fuel[53] competition over land:

> As corn and soybean are staple food crops for humans as well as the two main conventional feedstuffs that provide energy and protein for food-producing animals, the projected global population rise, along with the expansion of animal production, presents a serious threat to nutrition security for both humans

[49] Olivier de Schutter, "The Emerging Human Right to Land" (2010) 12:3 Intl Community L Rev 303 at 306 [Schutter, "The Emerging Human Right"].

[50] Margret Vidar, "The Interrelationships Between the Right to Food and Other Human Rights" in Eide & Kracht *supra* note 28, 141 at 152.

[51] *Ibid* at 152 [emphasis added].

[52] Eric F Lambin & Patrick Meyfroidt, "Global Land Use Change, Economic Globalization, and The Looming Land Scarcity" (2010) 108:9 Proceedings of the National Academy of Sciences of the United States of America 3465 at 3466: "[d]ifferent land uses will be competing for the available land…Feeding a growing world population may require an additional 2.7–4.9 Mha of cropland per year on average. The actual amount will depend on future diets, food wastages, and food-to-feed efficiency in animal production (13). In 2007, production of the feedstocks for the current generation of biofuels required ≈25 Mha. Meeting the current policy mandates of petroleum substitution by biofuels would require an increase by 1.5–3.9 Mha per year."

[53] See also Geoff Cooper & J Alan Weber, "An Outlook on World Biofuel Production and Its Implications For the Animal Feed Industry" in Harinder, PS Makkar & FAO, eds, *Biofuel Co-Products as Livestock Feed: Opportunities and Challenges* (Rome: FAO, 2012).

> and animals. However, the increasing use of these feedstocks for biodiesel and bioethanol production has driven up their global prices. From 2007 to 2011, the worldwide production of bioethanol nearly doubled from 49.6 to 84.6 billion liters. In parallel, the price of corn was increased from $163 to $291 per metric ton over the four years. In 2011, the United States produced approximately 12.4 billion bushels of corn, and 38% of which was used to produce bioethanol or to generate other co-products. Apparently, current allocations of corn and(or) soybean for the biofuel and animal productions are unsustainable. Alternatives to these ingredients are required to maintain a harmonious infrastructure among the fuel, food, and feed industries.[54]

While recognizing that animal feed represents an additional challenge to realizing the human right to food in many jurisdictions and that many of the arguments marshalled in this article against the agro-biofuel industry could also be deployed against crops grown for animal feed, this article will not be addressing feed crops in the arguments below for the sake of a singular focus upon the fuel or food dichotomy. In the subsections that follow, the phenomenon of global land acquisitions and changing land use patterns will be used to demonstrate the necessity of, and justification for, government action[55] finding its legal basis in the abovementioned international treaties.[56]

i. Exponential Increases in Global Land Acquisitions: Land Grabs

Global land acquisition, often times controversially referred to as land grabs, describes "the explosion of (trans)national commercial land transactions (and land speculation) that has been occurring in recent years around the large-scale production, sale, and export of food and biofuels."[57] In other words, the land grab phenomenon represents the market stakeholders' responses "to food price reversals generating export bans and government initiatives to secure offshore food and biofuel supplies and reflects a speculative interest in food and biofuel futures and associated land price inflation on the part of finance capital."[58] Land grabs are predominantly executed via private-private purchases, public-private purchases and leases for agro-biofuel production. These land grabs are motivated by the desire to

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[54] Krystal K Lum, Jonggun Kim & Xin Gen Lei, "Dual Potential of Microalgae as Sustainable Biofuel Feedstock and Animal Feed" (2013) 4:53 J Animal Science & Biotechnology 1.

[55] OECD Checklist, *supra* note 25 at question 2: Is government action justified?

[56] *Ibid*, question 4: Is there a legal basis for regulation?

[57] Saturnino M Borras Jr & Jennifer Franco, "Towards a broader view of the politics of global land grab: Rethinking land issues, reframing resistance" (2010) Initiatives in Critical Agrarian Studies Working Paper No 001 at 2, online: <www.tni.org/files/Borras%20Franco%20Politics%20of%20Land%20Grab%20v3.pdf> [Borras & Franco].

[58] Philip McMichael, "The Land Grab and Corporate Food Regime Restructuring" (2012) 39:3–4 J Peasant Studies 681 at 683.

safeguard against the next global energy or food crisis.[59] For example, China, among many others,[60] has emerged as a dominant government player in land acquisition strategies due to the substantial loss of Chinese agricultural land to industrial development.[61] Despite the desire to adopt preventive measures against a speculative, yet probable, crisis, the current regulatory safeguards for such transactions, where there even are any, do not engage in fighting hunger amongst the populace of regions where land acquisition transfers have taken and are taking place.[62] Rather, the purchased cultivable lands are either left untouched or, if worked, are "predominantly used to grow crops for export, often for use as biofuels",[63] thus exacerbating the lack of access to food in that locality and ultimately undermining the right to food.

An investigation conducted by the International Food Policy Research Institute found that dominant European biofuel corporations have heavily invested in land for agro-biofuel technology practices in targeted African countries such as Ethiopia, Mozambique and Tanzania.[64] Furthermore, the countries of the global south, already plagued by an unfulfilled right to food, have witnessed the conveyance of vast areas of their agricultural lands into the hands of foreign investors.[65] Between 2008 and 2009, the World Bank recorded 405 agricultural land acquisitions and found that 21% were aimed at agro-biofuel crop production and 37% were slated for food crops.[66] This data suggests that the driving force behind land grabs is not agro-biofuel technology applications but rather increased production of food.

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[59] Saturnino M Borras Jr et al, "Towards a Better Understanding of Global Land Grabbing: An Editorial Introduction" (2011) 38:2 J Peasant Studies 209 at 209. Borras argues "[p]owerful transnational and national economic actors from corporations to national governments and private equity funds have searched for 'empty' land often in distant countries that can serve as sites for fuel and food production in the event of future price spikes." (*ibid*). See also Grain, "Seized! The 2008 Land Grab for Food and Financial Security" (24 October 2008), online: <www.grain.org/article/entries/93-seized-the-2008-landgrab-for-food-and-financial-security> [Grain, "Seized"]. Furthermore, McMichael argues that "the 'global land grab' aris[es] from a combination of *new* mercantilist food security practices, as governments sponsor offshore agriculture to ensure national food security, and offshore investment in land for biofuels production." Philip McMichael, "Agrofuels in the Food Regime" (2010) 37:4 J Peasant Studies 609 at 614 [McMichael, "Agrofuels"][emphasis in original].

[60] For a non-exhaustive list of countries fervently engaging in land grab practices see Grain, "Seized" *supra* note 59 at 3: "China, India, Japan, Malaysia and South Korea in Asia; Egypt and Libya in Africa; and Bahrain, Jordan, Kuwait, Qatar, Saudi Arabia and the United Arab Emirates in the Middle East."

[61] *Ibid*.

[62] Kate Geary, "'Our Lands, Our Lives': Time Out on the Global Land Rush" (October 2012) Oxfam Briefing Note at 6, online: <oxfam.org/sites/www.oxfam.org/files/bn-land-lives-freeze-041012-en_1.pdf>.

[63] *Ibid* at 2.

[64] Joachim von Braun & Ruth Meinzen-Dick, "'Land Grabbing' by Foreign Investors in Developing Countries: Risks and Opportunities" (2009) International Food Policy Research Institute Policy Brief No 13 at 8.

[65] Peter Messerli et al, "From 'Land Grabbing' to Sustainable Investments in Land: Potential Contributions by Land Change Science" (2013) 5 Current Opinion in Environmental Sustainability 528 at 528–29.

[66] Lester R Brown, "Food, Fuel and the Global Land Grab" (2013) 47:1 Futurist 21 at 22.

ii. On The Lands of Change

As alluded to earlier, the end use of cultivated crops is trifurcated between food, agro-biofuel and livestock feed,[67] and it has been contended that sustainably worked agricultural lands can sustain these end uses.[68] Specifically, scholars of farming redesign strategies, which are "rooted in a desire to mimic ecological processes",[69] argue that in fostering such an approach, food and fuel agricultural production can in fact coexist sustainably in optimal conditions.[70] The studies have further pinpointed a controllable variable, namely land types that would sustain agro-biofuel technology application.[71]

Although the intention is to identify optimal variables and conditions that would allow for a cohesive tripartite food-fuel-feed agricultural practice, other agricultural land allocation strategies have gained traction amongst national, transnational and international investor stakeholders. These stakeholders, themselves either public or private entities, while dedicating *agricultural* land for the production of food, also allocate various other land types, such as forests, marginal lands and idle lands,[72] to the production of agro-biofuel crops. Suffice it to say, there exists a clear disparity between the goal of achieving a joint agricultural practice between crops for food and crops for agro-biofuels and the current agricultural trends led by private and state actors.

Furthermore, there exists an impression that with better sustainability practices agricultural land can sustain and support both food and certain biofuel crops.[73] However, "[i]t has been suggested that biofuel expansion can compete with food production *directly* (e.g., food crops diverted for

[67] The livestock feed crops are spurred by "an increasing pressure on the livestock sector to meet the growing demand for high-value animal protein. The world's livestock sector is growing at an unprecedented rate and the driving force behind this enormous surge is a combination of population growth, rising incomes and urbanization. Annual meat production is projected to increase from 218 million tonnes in 1997–1999 to 376 million tonnes by 2030." FAO, "3. Global and Regional Food Consumption Patterns and Trends", online: <www.fao.org/docrep/005/ac911e/ac911e05.htm>. Additionally, Deiniger argues that "[p]opulation growth, rising incomes, and urbanization will continue to drive demand growth for some food products, especially oilseed and livestock, and related demands for feed and industrial products." Deiniger, *supra* note 1 at XXVIII.

[68] Barry D Solomon, "Biofuels and Sustainability" (2010) 1185 Ann NY Acad Sci 119.

[69] RJ McRae, D Lynch & RC Martin, "Improving Energy Efficiency and GHG Mitigating Potentials in Canadian Organic Farming Systems" (2010) 34:5 J Sustainable Agriculture 549 at 551.

[70] *Ibid* at 567–69.

[71] McRae, Lynch and Martin argue that "[a]key system level consideration is what the energy crops replace as a farmer transitions into such production. Ideally, land that was degraded or at least marginal for annual food and feed crops or poorly managed pasture, and could have been creating negative environmental impacts as a result, is converted to an energy crop that meets the above criteria. Less desirable is conversion of natural habitats to energy crop production, especially annual plants because the loss of soil carbon significantly reduces or eliminates the benefits of generating alternative fuels." (*ibid* at 568) [citations omitted].

[72] See Borras, "Politics of the Global Land Grab", *supra* note 57 at 13.

[73] Solomon, *supra* note 68 at 119.

biofuel production) and *indirectly* (e.g., competition for land and agricultural labour)."[74] Despite these suggestions, governments have blindly adopted the former impression in legislation[75] in support of agro-biofuel technology. This legislation has been implemented without consideration of the impact upon, and direct and indirect competition with, food production. Rather, food production concerns are overridden by environmental policy objectives. An analyst noted that "the social and ecological consequences of converting crop land and forest into a new profit frontier are hidden behind a façade of market environmentalism."[76] Canadian legislation exemplifying the environmentalist approach promoting agro-biofuels includes the federal *Alternative Fuels Act*[77] and Ontario's *Alternative Fuels Regulations*.[78] Both prescribe "the mandatory utilization of alternative fuels"[79] and "[t]he *Alternative Fuels Act* aims to favour the utilization of alternative fuels in motor vehicles and to set a leadership example at the national level in promoting r*enewable non-petroleum-based fuels*."[80] Canada is not alone in grounding and modeling its legislative justifications for supporting agro-biofuels in environmentalism as the vast majority of governments have adopted a similar stance.[81]

When examining national agro-biofuel technology policy objectives that establish domestic agro-biofuel consumption quotas or mandatory agro-biofuel and fossil fuel blending requirements,[82] it becomes apparent that these

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[74] Alexandros Gasparatos, Per Stromberg & Kazuhiko Takeuchi, "Biofuels, Ecosystem Services and Human Wellbeing: Putting Biofuels in the Ecosystem Services Narrative" (2011) 142:3 Agriculture, Ecosystems & Environment 111 at 115 [emphasis added].

[75] Witcover, Yeh and Sperling argue that "[a] number of policies premised on reducing greenhouse gas (GHG) emissions, lowering reliance on oil imports, and stimulating rural development are being adopted to increase biofuel production and use. In the US, the Renewable Fuel Standard (US-RFS2) mandates the sale of increasing quantities of biofuels with lower lifecycle GHG emissions intensity than petroleum fuels, measured in carbon dioxide equivalents per unit energy of fuel (e.g., gCO2e/MJ), reaching 36 billion gallons in 2022 (EPA, 2010a). The European Union's Renewable Energy Directive (EU-RED) requires 10% renewable energy in transport by 2020 (European Union, 2009a). EU-RED also sets a minimum GHG intensity percent threshold for reduction compared with petroleum fuels. The minimum threshold increases over time. Complementary to EU-RED, the Fuel Quality Directive (EU-FQD) requires a 6% reduction in transport fuel lifecycle GHG intensity between 2010 and 2020 (European Union, 2009b). California has a policy similar to the Fuel Quality Directive, the Low Carbon Fuel Standard (CA-LCFS), with a goal of 10% reduction in transport fuel GHG intensity by 2020 (CARB, 2009)." Julie Witcover, Sonia Yeh & Daniel Sperling, "Policy Options to Address Global Land Use Change From Biofuels" (2013) 56 Energy Policy 63 at 63–64.

[76] McMichael, "Agrofuels", *supra* note 59 at 609.

[77] *Alternative Fuels Act*, SC 1995, c 20.

[78] *Alternative Fuels Regulation*, SOR/96–453.

[79] Ngo Anh-Thu, Paule Halley & Peter Calkins, "Bio-fuels in Canada: Normative Framework, Existing Regulations, and Politics of Intervention" (2008) 4:1 JSDLP 19 at 28.

[80] *Ibid* [emphasis added].

[81] Demirbas argues that "[t]he central policy of biofuel concerns job creation, greater efficiency in the general business environment, and protection of the environment." Ayhan Demirbas, *Biofuels: Securing the Planet's Future Energy Needs* (London: Springer London, 2009) at 320.

[82] Hughes, Partzsch & Gaskell argue that "[f]or example, Europe's pledge to replace 5.75 percent of their fuels with biofuels by 2010 and the United States' proposal to substitute fifteen percent of U.S. gasoline

benchmarks have imposed a heavy burden on agricultural lands. Essentially, to achieve the specified quota, a great portion of agricultural lands would need to be converted from food production to agro-biofuel production,[83] therefore, making locally grown food less accessible:

> Demand for biofuel feedstocks is a major factor for world agriculture with land conversion for biofuels by 2030 estimated to range between 18 and 44 million ha (Fischer and others 2008)…Potential impacts on land use could be large (Searchinger and others 2008). Over 2008–18, biofuel feedstocks may account for 52 percent of the increased demand for maize and wheat, and 32 percent of that for oilseeds (OECD and FAO 2010). Biofuel mandates also drive expansion of sugarcane for ethanol. Brazil processes half its cane into ethanol, and the cane area is expected to double by 2017.[84]

Astonishingly, "[e]stimates suggest that the US would have to convert all the corn and soy it currently produces into biofuels in order to achieve its target, while the EU target would require 70% of its agricultural land."[85] Such statements demonstrate why the right to food must be championed, as the current national agro-biofuel technology practices and policies, if allowed to reach their objectives, would render arable lands unavailable for food crops, thus decreasing the amount of food produced and consequently increasing its price.[86]

As alluded to in the previous section, many states and private corporations have not limited land conversion in their respective jurisdictions, but have also converted land abroad for agro-biofuel production.[87] This energy-driven shift in land use has been characterized as a transition "from feeding people in developing countries to fuelling cars in the industrialized world"[88] and "exposes the very logic of [the] contemporary capitalist development model and its pattern of production and consumption."[89] If proponents of agro-biofuel technology were to contend that land use conversion from food production to agro-biofuel production would be exclusively destined for local consumption, thus benefiting the domestic market, their argument would lose credence since the presupposed land use conversions, done

use with biofuels by 2017 will place enormous demands on existing cropping systems." Sara Hughes, Lena Partzsch & Joanne Gaskell, "The Development of Biofuels Within the Context of the Global Water Crisis" (2007) 7 Sustainable Development L & Policy 58 at 58.

[83] Lambin & Meyfroidt, *supra* note 52 at 3466.

[84] Deiniger, *supra* note 1 at 15.

[85] Ann Sofie Cloots, "Biofuels and the Right to Food: An Uneasy Partnership" in Olivier de Schutter & Kaitlin Y Cordes, eds, *Accounting for Hunger: The Right to Food in the era of Globalisation* (Oxford: Hart Publishing, 2011) 95 at 101.

[86] Speight and Singh argue that"[t]he impact on food security is one of the primary concerns, in terms of scarcity of food supply, food production levels and impacts to price." Speight & Singh, *supra* note 5 at 155.

[87] Borras and Franco argue that "2.4 million hectares of land in Africa formally allocated to large-scale transactions converting land use from food to biofuel production for export between March 2006 and March 2009 alone". Borras & Franco, *supra* note 57 at 14.

[88] *Ibid* at 15.

[89] *Ibid*.

with local and domestic aims, can be subsumed by highly lucrative export practices.[90]

The conversion of land from the production of food to agro-biofuel crop production, coupled with the drastic decrease in the availability of arable land and the constant growth of the global population, emphasizes the heightened necessity to refrain from allocating land to agro-biofuel technology practice. This would have the effect of ensuring a sufficient food supply and therefore upholding the right to food. Cloots argues that this fundamental human right requires governments to "carefully assess the impact of their biofuel targets on the countries where such fuel would be predominantly produced, in order to ensure that their national biofuel policies do not have negative impacts on the enjoyment of the right to food of the populations of those countries."[91]

The continuing tension between land for agro-biofuel and land for food extends well beyond the parameters of agricultural, marginal or idle land. To counter ever-present land availability concerns and the increased demand for agro-biofuel, the agro-biofuel industry, including government and non-governmental actors, have engaged in deforestation practices in many regions of the global south.[92] This deforestation results in a loss of biodiversity and further undermines the right to food. According to the World Rainforest Movement, large areas of land are being used for plantations for agrofuel and forests are being razed to make room for oil palm, sugar cane and various other crops.[93] An example of this practice is found in Brazil, which "[i]n order to satisfy future global demand…will need to clear an additional 148 million acres of forest."[94]

It should be noted that studies conducted by both camps on the biofuel-deforestation debate have yielded opposing results with pro-biofuel advocates claiming that biofuel technology is neither a driver nor a cause of deforestation, while anti-biofuel advocates argue the contrary.[95] However,

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[90] *Ibid* at 16.

[91] Cloots, *supra* note 85 at 101.

[92] Borras and Franco identify two examples of this deforestation: "[A]nother controversial and widely protested type of land use change [is the] clearing [of] forests in the South in order to fuel cars in the North. Again, the biofuel expansion into the Brazilian Amazon and the massive clearing of Indonesian forests are two of the most important examples." Borras & Franco, *supra* note 57 at 19.

[93] McMichael, "Agrofuels", *supra* note 59 at 616–17. See also Saori Miyake et al, "Land-use and Environmental Pressures Resulting From Current and Future Bioenergy Crop Expansion: A Review" (2012) 28:4 J Rural Studies 650 at 651–52: "In Brazil, soybean production, cattle ranching, and more recently global demand for sugarcane ethanol, are the major drivers of the conversion of native forests and savannas to agriculture …A simulation based on Brazil's biofuels targets for 2020 estimates that sugarcane ethanol and soybean biodiesel will be responsible for 41% and 59% of indirect deforestation in Brazil respectively".

[94] Isabella Kenfield, "Is Ethanol the Solution or the Problem?" (March 12, 2007), online: <www.alternet.org/environment/49138>, cited in Richard L Ottinger, "Biofuels: Potentials, Problems, and Solutions" (2009) 19:2 Fordham Envtl LJ 253 at 255–56.

[95] Yan Gao, Margaret Skutsch & Omar Masera, "The Challenges of Estimating Tropical Deforestation Due to Biofuel Expansion" in Alexandros Gasparatos & Per Stromberg, eds, *Socioeconomic and Environmental Impacts of Biofuels: Evidence From Developing Nations* (Cambridge: Cambridge University Press, 2012) 90 at 91–92.

a recently conducted study superimposing deforestation trends with agro-biofuel practices in specifically targeted regions indicates that a correlation exists between biofuel technology application and deforestation.

> The global deforestation map and the global biofuel hotspots map are compared. This shows that within Latin America, deforestation and biofuel production overlap in Brazil (mainly in Mato Grosso where biodiesel from soya is produced, but also to some extent in São Paolo, where ethanol from sugarcane is produced), and in the north of Argentina (Santa Fe, Santiago del Estero and Chaco provinces, where biodiesel from soya is produced). … Within Asia, deforestation and biofuel production areas overlap in Indonesia and Malaysia, where biodiesel from oil palm is produced.[96]

Article 11(2) of the *ICESCR* suggests that deforestation can be a method of increasing food production,[97] and, therefore, a means of safeguarding the right to food, provided that cleared lands are strictly dedicated to food crop production and the produce is solely destined for local consumption and the domestic market. However, as alluded to above, studies indicate that forest lands are cleared for agro-biofuel production rather than food production,[98] impairing the realisation of the right to food. The obstruction of this human right is more pronounced for peoples in the vicinity of deforested lands[99] as "[i]t is estimated that 60 million indigenous people are completely dependent on forests, 350 million people are highly dependent and 1.2 billion have some dependence on forests for their livelihoods."[100] In addition, "[i]f forests are cleared in favour of large-scale biofuel production, local communities will suffer twice, by losing their land and by facing higher food prices."[101] Furthermore, even if deforested lands were allocated to food production, the efficacy and desirability of pursuing deforestation to fulfill the right to food remains highly contentious. First, it has been argued that "[t]here is enough food in the world to feed everyone adequately; the problem is distribution"[102] and, second, "analysts have agreed that food security is not addressed by increased food production".[103] As such, deforestation appears to be an untenable strategy for, and likely a hindrance to, securing the right to food.

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[96] Yan Gao et al, "A Global Analysis of Deforestation due to Biofuel Development" (2011) Center for International Forestry Research Working Paper 68 at 19.

[97] *ICESCR*, *supra* note 27 at art 11(2).

[98] Borras & Franco, *supra* note 57 at 18–19. See also Gao et al, *supra* note 96 at 15–24.

[99] Cloots, *supra* note 85 at 111.

[100] Jay Williams, "The Impact of Climate Change on Indigenous People—the Implications For the Cultural, Spiritual, Economic and Legal Rights of Indigenous People" (2012) 16:4 Intl JHR 648 at 650. Cloots argues that "[f]orests provide a livelihood to many people, either in the form of fruits or hunting territory, or as a place to collect wood for cooking." Cloots, *supra* note 85 at 111.

[101] *Ibid*.

[102] Susan Baker, *Sustainable Development* (London: Routledge, 2015) at 357; Ross Mars, *The Permaculture Transition Manual* (Gabriola Island: New Society Publishers, 2016) at 5.

[103] Chidi Oguamanam, *Intellectual Property in Global Governance: A Development in Question* (New York: Routledge, 2012) at 125.

Engaging in deforestation for agro-biofuel technology application not only leaves the right to food unfulfilled, but also causes a loss of biodiversity that has a further, undesired impact on the fundamental human rights of indigenous communities. As implied above, forests, primarily in the global south,[104] have been dramatically shrinking, resulting in a myriad of ecological, environmental and social consequences. The forces driving deforestation are numerous and interrelated;[105] however, it has been suggested that agro-biofuel technology application is a factor.[106] Furthermore, deforestation is directly linked to a loss of biodiversity. Therefore, forest clearing for the application of agro-biofuel technology, which, as examined above, primarily occurs in countries of the global south, has the effect of causing biodiversity loss in those regions.[107] The application of agro-biofuel technology itself exhibits four of the six causes of biodiversity losses, namely "habitat destruction, invasive species, pollution and climate change."[108] Furthermore, the negative impact on the right to food is readily discernible amongst the communities living in close proximity to these forest ecosystems. Indigenous peoples and local communities have deep cultural, traditional and social relations with their ecosystems and are inextricably dependent upon the plethora of plant species used for traditional medicines and consumption. Biodiversity loss from deforestation for agro-biofuel technology application undermines the goal of food supply and the conservation of all food varieties.

B. Food Pricing: When the Sky is Not the Limit

Blakeney argues that "[h]unger is a profound affront to human dignity and human rights."[109] Despite an international focus on securing the right to food, the twenty-first century continues to be affected by hunger, malnutrition and undernourishment; it is estimated that more than one billion people were undernourished in 2009.[110] Paradoxically, "70% of the world's hungry are involved in agriculture themselves, either as smallholders or as landless labourers."[111]

[104] Donald cautions that "[a]round 15 million ha of the Earth's primary forest are lost each year, most of it in the tropics.…Because tropical forests may support as much as 70% of the planet's plant and animal species, deforestation in the tropics represents the greatest single threat to global biodiversity. Deforestation is proceeding most rapidly in those countries holding the planet's richest biodiversity". Paul F Donald, "Biodiversity Impacts of Some Agricultural Commodity Production Systems" (2004) 18:1 Conservation Biology 17 at 17.

[105] See generally Helmut J Geist & Eric F Lambin, "Proximate Causes and Underlying Driving Forces of Tropical Deforestation", (2002) 52:2 BioScience 143.

[106] Miguel A Altieri, "The Ecological Impacts of Large-Scale Agrofuel Monoculture Production Systems in the Americas" (2009) 29:3 Bulletin Sciences Technology & Society 236 at 238.

[107] Gasparatos, Stromberg & Takeuchi, *supra* note 74 at 118.

[108] *Ibid*.

[109] Michael Blakeney, *Intellectual Property Rights and Food Security* (Wallingford, Oxfordshire: CABI, 2009) at 1.

[110] MC Tirado et al, "Addressing the challenges of climate change and biofuel production for food and nutrition security" (2010) 43:7 Food Research Intl 1729 at 1729.

[111] Asbjørn Eide, "The Importance of Economic and Social Rights in the Age of Economic Globalisation" in

An important causal factor of hunger is sinusoidal food price fluctuations.[112] Food prices have been increasing exponentially since 2002[113] and surged to historical all-time highs between 2006 and 2008.[114] Following the 2008 world food price crisis, scholars investigated and identified factors that underpinned the record high prices and food price volatility generally. The World Bank concisely summarized the findings of numerous studies on this topic and it should be noted that this is the only "paper to date that has attempted to add explicit orders of magnitude to different factors."[115] On May 1st, speaking before the joint economic committee of Congress, the Chief Economist of the USDA

> *attributed much of the increase in farm prices of maize and soybeans to biofuels production* … The IMF estimated that the *increased demand for biofuels accounted for 70 percent of the increase in maize prices and 40 percent of the increase in soybean prices* … Collins (2008) used a mathematical simulation to estimate that a*bout 60 percent of the increase in maize prices from 2006 to 2008 may have been due to the increase in maize used in ethanol*. Rosegrant, et al. (2008), using a general equilibrium model, calculated the long-term impact on weighted cereal prices of the acceleration in biofuel production from 2000 to 2007 to be 30 percent in real terms. Maize prices were estimated to have increased 39 percent in real terms, wheat prices increased 22 percent and rice prices increased 21 percent.[116]

Agro-biofuel technology surfaces as an important factor in each study and is, undeniably, the common thread amidst the various identified factors that led to the rising food prices.

Two additional studies are also noteworthy for investigating the link between agro-biofuel production and the 2008 crisis. First, the United Nations conducted a study in 2011 and concluded that one reason for the increasing demand for agro-biofuel crops was the billions of dollars in subsidies that encouraged the production of these crops.[117] As a result "[i]n the United States

Eide & Kracht, *supra* note 28, 3 at 3.

[112] For a non-exhaustive enumeration of hunger causes, please refer to United Nations World Food Programme, "Hunger: What causes hunger?", online: World Food Programme <www.wfp.org/stories/what-causes-hunger>. See also OECD, "Rising Food Prices: Causes and Consequences" (2008), online: <www.oecd.org/trade/agricultural-trade/40847088.pdf>.

[113] Donald Mitchell argues that "[t]he IMF's index of internationally traded food commodities prices increased 130 percent from January 2002 to June 2008 and 56 percent from January 2007 to June 2008". Donald Mitchell, "A Note on Rising Food Prices" (2008) The World Bank Policy Research Working Paper No 4682 at 2.

[114] Govinda Timilsina et al, "The Impacts of Biofuel Targets on Land-Use Change and Food Supply: A Global CGE Assessment" (2010) World Bank Policy Research Working Paper No 5513 at 2. The food crisis did not end in 2008; another food crisis occurred in 2011. See Aaron Sternick, "Food Fight: The Impending Agricultural Crisis and a Reasonable Response to Price Volatility" (2012) 23:1 Vill Envtl LJ 145 at 165.

[115] Derek Heady & Shenggen Fan, "Anatomy of a crisis: The causes and consequences of surging food prices" (2008) 39:3 Agricultural Economics 375 at 375.

[116] Mitchell, *supra* note 113 at 4 [emphasis added].

[117] United Nations Department of Economic and Social Affairs, *The Global Social Crisis: Report on the World Social Situation* 2011 (New York: United Nations 2011) at 68, online: <www.un.org/esa/socdev/rwss/docs/2011/rwss2011.pdf>.

alone, 119 million out of 416 million tons of grain produced in 2009 went to ethanol distilleries. The grain would have been enough to feed 350 million people for a year!"[118] Second, the G-24 Discussion Paper Series emerged from the United Nations Conference on Trade and Development and identified agro-biofuel technology application as a "unique factor" distinguishing the 2008 crisis from earlier food price volatility.[119] In addition to government objectives identified in the previous study, concerns regarding energy security and climate change played a role in advancing the application of agro-biofuel technology.[120] As a consequence

> [t]he 2007 United States Energy Bill almost quintupled the biofuels target to 35 billion gallons by 2022, while the EU aims to use biofuels for 10 per cent of its transportation fuels by 2020. The European Union, the largest biodiesel producer, began to increase biodiesel production in 2005 while the United States ethanol production began to rise rapidly in 2002 and jumped from 1 billion gallon in 2005 to 5 billion in 2006 and is estimated to reach 9 billion in 2009. Between 1980 and 2002, the amount of corn used to produce ethanol in the United States rose by 24 million metric tons. Between 2002 and 2007, the quantity of the United States corn used to produce ethanol increased by 53 million metric tons, accounting for 30 per cent of the global growth in wheat and feed grains use.[121]

In short, market analysts have suggested that a gamut of factors[122], of which agro-biofuel is a considerably weighty variable,[123] contributed to the increase in global food prices; the factors driving agro-biofuel production included rising

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[118] *Ibid*.

[119] Anuradha Mittal argues that "[a] prominent difference between the current food price crisis and earlier ones is the increase in demand for coarse grains due to biofuels production in the United States and the EU. Biofuels and the related consequences of low grain stocks, large land use shifts, speculative activity, and export bans, have been held responsible for the 70–75 per cent increase in food prices (Mitchell, 2008)." Anuradha Mittal, "The 2008 Food Price Crisis: Rethinking Food Security Policies", (2009) UNCTAD G-24 Discussion Paper No 56 at 6, online: <www19.iadb.org/intal/intalcdi/PE/2009/04311.pdf>.

[120] "High oil prices in recent years, together with concerns over energy security and climate change, have led to the promotion of the production and use of biofuels as a supplement to transportation fuels…Biofuels have received a further boost through generous policy support (subsidies and tariffs on imports) and ambitious mandates," (*ibid*).

[121] *Ibid*.

[122] As mentioned earlier, population increase is another factor driving food price hikes. See e.g. Eric Merkley, "Food Inflation and Biofuel Production: Will the Pursuit of Clean Energy Be Made Off the Back of the World's Poor?" (2012) Frontier Centre for Public Policy Policy Series No 127 at 11: "The biofuel industry does not shoulder all the blame for the recent increase in food prices. Several other factors are cited as being responsible for the spike, although there is disagreement as to the extent of their involvement. One factor is the rise of the middle class in China and India. As these two powers develop, there is an increase in consumption and a rising demand for meat as diets improve. This creates an increased demand for feed grain and contributes to higher prices."

[123] "The International Food Policy Research Institute (IFPRI) found that biofuel is responsible for 30 per cent of the increase in overall food prices and 39 per cent of the rising cost of corn", (*ibid* at 8). See also Amela Ajanovic, "Biofuels Versus Food Production: Does Biofuels Production Increase Food Prices?" (2011) 36:4 Energy 2070 at 2074: "According to various studies… biofuels were considered to be the main driver of increasing feedstock prices. Other impact factors, such as droughts in Australia, poor crops in the EU and Ukraine in 2006 and 2007, higher demand from China and India, or the development of the world crude oil price, were not considered as very significant."

energy and consumption demands[124] and environmental preoccupations. The latter demands ultimately fuelled the production and promotion of agro-biofuel technology as many governments implemented policy objectives in support of this technology.[125] "Several international development agencies, including the World Bank and the International Monetary Fund, agree that the increasing demand for feedstock for the production of biofuels has played *an important role* in the rise in food prices".[126] As Speight and Singh noted, the studies also further reveal a *direct* correlation between the increase of food prices and the legislative and policy objectives that promote or prescribe biofuel production for blending mandates.[127] This put pressure on the agricultural landscape and consequently diverted traditional food crop cultivation practices to a purely economic and energy driven endeavour:

> Studies of the impacts of the U.S. biofuel industry generally have concluded that large programs such as those included in the "Energy Independence and Security Act of 2007" would lead to *food price increases, use of a large fraction of U.S. corn for ethanol, and bring about a consequent decline of corn use for domestic feed and industrial uses and exports.*[128]

Furthermore, "[c]oarse grains output is estimated to have been about 3% higher in 2006, solely due to the increase in renewable fuel use"[129] and "changes in the global fuel economy led to declines in the output of other agricultural and forestry activities, as land was diverted to corn production."[130] A further example of the direct impact of agro-biofuel technology on food pricing was the conversion of 20% of the United States' corn crops to ethanol production that resulted in a sharp increase in the price of corn in 2007.[131] Moreover, the resulting price inflation was not only felt within the United States' borders but also had a direct impact on the food supply and prices of jurisdictions that import produce.[132]

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[124] Steven Sexton et al, "The Intersection of Energy and Agriculture: Implications of Rising Demand for Biofuels and the Search for the Next Generation", *Agricultural and Resource Economics Update* 10:5 (May 2007) 4 at 4 online: <s.giannini.ucop.edu>.

[125] Daniel Lacalle & Diego Parrilla, *The Energy World Is Flat: Opportunities from the End of Peak Oil* (Chichester: John Wiley & Sons Ltd, 2015) at 193–95.

[126] Joy Clancy, *Biofuels and Rural Poverty* (New York: Routledge, 2013) at 102 [emphasis added].

[127] Speight and Singh argue that "these hikes in food prices corresponded with the introduction of biofuel consumption mandates in the United States, Europe and some other countries and rapid increases in global biofuel production". Speight & Singh, *supra* note 5 at 170.

[128] Thomas W Hertel, Wallace E Tyner & Dileep K Birur, "The Global Impacts of Biofuel Mandates" (2010) 31:1 Energy J 75 at 75–76 [emphasis added].

[129] *Ibid* at 87.

[130] *Ibid*.

[131] Arnold W Reitze Jr, "Biofuels—Snake Oil For the Twenty-First Century" (2008) 87:1 Or L Rev 1183 at 1213.

[132] Reitze Jr argues that "[t]he use of ethanol for fuel has raised the price of food and threatens the food supply of those nations that depend on U.S. food exports because farmland is being used to grow corn for ethanol production" (*ibid)*. Sternick argues that "[o]n a structural level, the dramatic rise in food prices is a problem of maximized exports and, because of a low domestic supply, overly expensive imports." Sternick, *supra* note 114 at 156. See also Meidad Kissinger, William E Rees & Vanessa Timmer,

Food crops, notably corn, wheat, sugar cane and palm oil, are the crops predominantly targeted for agro-biofuel technology application and "form the largest part of the diets of poor people."[133] In fact, food price fluctuations weigh heavily on poor populations who allocate nearly 75% of their earnings to food and are, therefore, "less able to absorb sudden price increases. Such volatility goes against one main aspect of the right to food, namely the regular and permanent access to food."[134] A one-percent increase in food prices means potentially encroaching on 16 million additional individuals' right to food.[135] Moreover, ricochet price effects on non-agro-biofuel crops, notably meat, poultry and dairy, can also result from agro-biofuel technology practice.[136] Therefore, the far-reaching price effects caused by agro-biofuel technology application undermine the right to food by erecting food price barriers that hinder the regular access to food.

Despite record crop yields worldwide, food commodity prices, such as those for staple cereals and sugars, have reached record highs[137] and this trend has not abated. In fact, "food prices have remained high by historical standards and are predicted to stay high in the years to come."[138] Importantly, these elevated food prices starkly effect the developing world's population, which spend a significant amount of their earnings on purchasing food.[139] By way of example, nearly half of the disposable income of persons in Pakistan, Indonesia and Azerbaijan is spent on purchasing food.[140] During the crisis of 2008, numerous food riots erupted across the globe giving voice to outrage over food price surges.[141] Discernibly, this outcry suggests that the use of agricultural food for biofuel transcends jurisdictional borders as neighbouring,

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"Interregional Sustainability: Governance and Policy in an Ecologically Interdependent World" (2011) 14:8 Environmental Science & Policy 965.

[133] Olivier De Schutter, R*eport of the Special Rapporteur on the Right to Food: Building Resilience: A Human Rights Framework for World Food and Nutrition Security*, UNHRC, 9th Sess, UN Doc A/HRC/9/23, (2008), at 16.

[134] Cloots, *supra* note 85 at 109. Runge & Senauer argue that "[t]he World Bank has estimated that in 2001, 2.7 billion people in the world were living on the equivalent of less than 2$ a day; to them, even marginal increases in the cost of staple grains could be devastating." Runge & Senauer, *supra* note 17 at 42.

[135] Cloots, *supra* note 85 at 108. See also Runge & Senauer, *supra* note 17 at 51.

[136] Runge & Senauer, *supra* note 17 at 45.

[137] Speight & Singh, *supra* note 5 at 170.

[138] Derek Headey & Shenggen Fan, *Reflections on the Global Food Crisis: How Did It Happen? How Has It Hurt? And How Can We Prevent the Next One?* (Washington DC: International Food Policy Research Institute, 2010) at 1, online: <www.ifpri.org/sites/default/files/publications/rr165.pdf>.

[139] Mueller, Anderson & Wallington argue that "in developing regions where unprocessed grains make up a considerable fraction of the daily diet, increases in commodity food prices can have a considerable impact. While the weekly outlay for food in developing countries is small in terms of US dollars, its percentage of the family budget is large. This larger share, combined with less flexibility to adjust expenditures in other budget areas, means that increases in food prices may cause hardship. In the US, consumers spend relatively little (on average, less than 10%) of their disposable income on food." Sherry A Mueller, James E Anderson & Timothy J Wallington, "Impact of Biofuel Production and Other Supply and Demand Factors on Food Price Increases in 2008" (2011) 35:5 Biomass & Energy 1623 at 1624.

[140] *Ibid*.

[141] *Ibid* at 1623.

or even far-away states, suffered from food price hikes occasioned by biofuel production in other states. Riots in Mexico exemplify this cross-border and spill-over effect as "[i]n 2007, food maize in Mexico became relatively scarce as US growers redirected their produce to ethanol production. Mexican prices rose steeply causing food riots and underscoring Mexico's direct interest in US agricultural and trade policy."[142]

C. Climate Change and Greenhouse Gas Emissions

The market price of agro-biofuel as well as food crops is further influenced by a number of externalities. The intersection between climate change, greenhouse gas emissions and agro-biofuel technology has given rise to heated debates regarding the technology's impact, or lack thereof, on this pronounced environmental problem. Alongside climate change preoccupations, the *Kyoto Protocol* was a major driver for agro-biofuel technology application.[143] In particular, agro-biofuel was seen as a means to considerably reduce greenhouse gas emissions in comparison to traditional fossil fuels.[144] This set the stage for the adoption of environmentally incentivised legislation and regulations around the world[145] including Canada.[146] However, numerous studies have since revealed that the touted environmental benefits of agrobiofuel technology are ephemeral and volatile.

In assessing the sustainability, viability and ecological benefits of agro-biofuels, numerous computational methodologies have been developed. These tools seek to determine "whether [agro-biofuels] provide net energy gains when compared with conventional fossil fuels."[147] The general consensus is that the Life Cycle Analysis (hereinafter, LCA) is "the most appropriate tool to answer such questions".[148] Under the general LCA umbrella are a variety

[142] Kissinger, Rees & Timmer, *supra* note 132 at 968.

[143] Speight & Singh, *supra* note 5 at 108. *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, 11 December 1997, 37 ILM 22 (1998) (entered into force 16 February 2005).

[144] Danny G Le Roy & Kurt K Klein, "The Policy Objectives of a Biofuel Industry in Canada: An Assessment" (2012) 2:4 Agriculture 436 at 437.

[145] Robert Bailis & Jennifer Baka, "Constructing Sustainable Biofuels: Governance of the Emerging Biofuel Economy" (2011) 101:4 Annals Assoc American Geographers 827 at 828.

[146] See e.g. Jeremy Moorhouse & Michael Wolinetz, "Biofuels in Canada: Tracking Progress in Tackling Greenhouse Gas Emissions From Transportation Fuels" at 3, online: Cleaner Energy Canada <cleanenergycanada.org/wp-content/uploads/2016/03/FINAL-Report-Biofuel-Policy-Review-March-2016.pdf>.

[147] Gasparatos, Stromberg & Takeuchi, *supra* note 74 at 115.

[148] *Ibid*. Requena et al argues that "[t]here is a broad agreement in the scientific community that LCA is one of the best methodologies for the evaluation of the environmental burdens associated with biofuel production, by identifying energy and materials used as well as waste and emissions released to the environment; moreover, it also allows an identification of opportunities for environmental improvement … LCA is a methodology for evaluating the environmental load of processes and products (goods and services) during their life cycle from cradle to grave." F Sanz Requena et al, "Life Cycle Assessment (LCA) of the Biofuel Production Process From Sunflower Oil, Rapeseed Oil and Soybean Oil" (2011) 92:2 Fuel Processing Technology 190 at 190.

of computational formulas; each variation of the formula either narrows or broadens its analysis to consider a specific set of conditions and boundaries. Of interest are two competing LCA computations. First, there is the Energy LCA that singularly "accounts for all the energy that goes into making a biofuel and compares it with energy contained in the produced fuel."[149] Second is the Entire LCA methodology that expands beyond simply looking to the production of agro-biofuel energy by also accounting for, and including in its computation, energy expenditures from the cultivation of raw materials "through [to] the production and utilization phases"[150] of the produced agro-biofuel itself. LCA methodologies have gone as far as to "consider direct and indirect effects of biofuels on global land and water resources, global ecosystems, air quality, public health, and social justice"[151] as well as "local air pollution, acidification, eutrophication, ozone depletion, [and] land use".[152]

The Entire LCA computation should be selected since it evaluates agro-biofuels' sustainability not only from a one-dimensional energy production perspective but from an all-encompassing viewpoint. This methodology effectively captures the macroscopic view of the overall biofuel production process including "agricultural activities, transport of feedstocks, biorefinery processes, biofuel distribution, and any support upstream activities."[153] Importantly, it incorporates into its analysis environmental considerations, namely greenhouse gas emissions, from the practice of agro-biofuel technology as a chained process; considering the role that greenhouse gas emissions played in the fervent application and worldwide implementation of agro-biofuel in the first place, this approach makes sense. The Entire LCA methodology effectively challenges the proclaimed "environmental" benefits of agro-biofuel technology as it highlights and establishes that every stage in the application of agro-biofuel technology results in the release of greenhouse gases. Moreover, agro-biofuel cultivated from wheat, corn and rapeseed can result in an increase of greenhouse gas emissions by 53%, 11%, and 72% respectively when compared to conventional fossil fuels.[154] Furthermore, when considered cumulatively, the greenhouse gas reduction benefits that may be derived from the entire biofuel production process (if any) are negated by the costs associated with production of the fuel as "[e]missions from land

[149] Dev S Shrestha & Anup Pradhan, "Energy Life Cycle Analysis of a Biofuel Production System", in Samir K Khanal et al, eds, *Bioenergy and Biofuel From Biowastes and Biomass* (Reston, Virginia: American Society of Civil Engineers, 2010) 411 at 411.

[150] M Kaltschmitt, G A Reinhardt and T Stelzer, "Life Cycle Analysis of Biofuels Under Different Environmental Aspects" (1997) 12:2 Biomass & Bioenergy 121 at 122.

[151] Requena et al, *supra* note 148 at 191.

[152] *Ibid* at 190.

[153] Kristina Wagstrom & Jason Hill, "Air Pollution Impacts of Biofuels" in Alexandros Gasparatos & Per Stromberg, eds, *Socioeconomic and Environmental Impacts of Biofuels: Evidence from Developing Countries* (Cambridge: Cambridge University Press, 2012) 53 at 57.

[154] Gasparatos et al, *supra* note 74 at 117.

use changes and from diesel combustion in farm equipment, water pumping, and production of fertilizer all erode the benefits of biofuels."[155] Finally, land use change and clearing for agro-biofuel technology application has also led to a rise in emissions. Specifically,

> [s]oils and plant biomass are the two largest biologically active stores of terrestrial carbon and hold about 2.7 times more carbon than the atmosphere. If land is cleared to allow for cultivation of food or energy crops, the carbon contained in the standing biomass and some of the carbon stored in the soil will be released to the atmosphere. A "carbon debt" is thus incurred when native ecosystems are converted to cropland.[156]

Studies have estimated that payback for the resulting carbon debt from land clearing of forests in the global south—that is, the difference between the amount of carbon stored in biomass and soil before clearing and the amount after the new crop has grown—is in excess of several hundred years.[157]

The accumulation of greenhouse gas emissions over centuries, caused mainly by human activity, has resulted in unprecedented environmental alterations, with climate change being the central concern.[158] Undoubtedly, climate change affects all aspects of the Earth's ecosystem, including agriculture,[159] which consequently effects edible food production; "[f]ood has always been linked to environmental condition with production, storage and distribution, and market all sensitive to weather extremes and climate fluctuations."[160] As they come to pass, the predictions of harsher weather conditions, specifically longer periods of drought or heavy rain, will adversely impact agricultural production, both for agro-biofuel and non-agro-biofuel produce. Effectively, climate change in combination with land (un-)availability concerns may undermine the production of edible food. This would ultimately influence market prices for food, which, as argued above, can contribute to hindering the realization of human right to food.

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[155] Office of Policy Analysis, *supra* note 2 at 47.

[156] *Ibid*.

[157] *Ibid* at 48. See also Joseph Fargione et al, "Land Clearing and the Biofuel Carbon Debt" (2008) 319:5867 Science 1235. Fargione et al argue that "[c]onverting rainforests, peatlands, savannas, or grasslands to produce food crop–based biofuels in Brazil, Southeast Asia, and the United States creates a 'biofuel carbon debt' by releasing 17 to 420 times more CO2 than the annual greenhouse gas (GHG) reductions that these biofuels would provide by displacing fossil fuels" (*ibid*).

[158] Thomas J Sauer & Michael P Nelson, "Science, Ethics, and the Historical Roots of Our Ecological Crisis: Was White Right?" in Thomas J Sauer, John M Norman & Kumar M Siva, eds, *Sustaining Soil Productivity in Response to Global Climate Change: Science, Policy, and Ethic*s (New Jersey: Wiley, 2011) 3 at 3.

[159] Tirado et al, *supra* note 110 at 1731.

[160] Diana Liverman & Kamal Kapadia, "Food Systems and the Global Environment: An Overview" in John Ingram, Polly Ericksen & Diana Liverman, eds, *Food Security and Global Environmental Change* (London: Earthscan, 2010) 3 at 3.

III. Proposed Agro-Biofuel Regulatory Regime

The rationale behind agro-biofuel technology policies in the United States, European Union, Brazil, Canada and many other jurisdictions is to achieve energy independence and security by reducing these states' reliance upon energy imports, and to address environmental concerns, notably to seek a reduction of greenhouse gas emissions.[161] In doing so, these states have treated the concerns argued in this article's first section as mere externalities and have deliberately left these concerns unaccounted for. Suffice it to say, the inability of these regimes to secure the fundamental human right to food in the face of the broad spectrum of interwoven issues raised above necessitates a change in regulation.[162] Furthermore, agro-biofuel technology's untenable impact upon the right to food demonstrates that the existing global soft-law based regimes are inadequate to remedy this problem, as is evidenced by the global land use trends identified above.[163]

As established in the first half of this article, incumbent upon *ICESCR* member states are international obligations "to adopt and implement policies that increase levels of food security and to *avoid policies that constrain their ability to do so*."[164] In spite of the explicit and unambiguous legal language employed in international agreements[165] such as the *ICESCR*, which clearly enunciate and inform states of their obligations,[166] the implementation of the human right to food is fraught with deficiencies in many states, including Canada.[167] Curiously, and by way of a pointed example, Canada holds an impressive record of signing and ratifying numerous agreements affirming the human right to food.[168]

[161] Witcover, Yeh & Sperling, *supra* note 75 at 63.

[162] OECD Checklist, *supra* note 25, question 1: Is the problem correctly defined?

[163] *Ibid*, question 3: Is regulation the best form of government action?

[164] Canadian Food Security Policy Group, *supra* note 27 at 4. [emphasis added]. OECD Checklist, *supra* note 25, question 4: Is there a legal basis for regulation?

[165] Regarding this, the FAO argues that "[w]hile it is important to bear in mind that national constitutions will not necessarily incorporate the precise wording of the ICESCR, it may be useful to recall the explicit obligations that the *ICESCR* imposes on State Parties." FAO, "Justiciability of the Right to Food" at 76, online: <ftp://ftp.fao.org/docrep/fao/010/a0511e/a0511e03.pdf> [FAO, "Justiciability"].

[166] The FAO argues that "[t]he human right to food is established in many international treaties and other instruments, including the Universal Declaration of Human Rights (1948), [and] the International Covenant on Economic, Social and Cultural Rights (ICESCR, 1966)…Thus the rights-based approach to food security has a further legal dimension in that governments have a legal obligation progressively to enable all individuals within their borders not merely to be free from hunger but to produce or procure, in ways that are fully consistent with their human dignity, food that is adequate for an active and healthy life." FAO, T*he Right to Food in Practice: Implementation at the National Level* (Rome: FAO, 2006) at 4, online: <www.fao.org/3/a-ah189e.pdf> [FAO, *Right to Food in Practice*].

[167] Rideout et al argue that "in spite of clear statements regarding the justiciability of the *International Covenant on Economic, Social and Cultural Rights* (*ICESCR*), there has been little progress in Canada in transferring this international stance to domestic legal precedent." Karen Rideout et al, "Bringing Home the Right to Food in Canada: Challenges and Possibilities for Achieving Food Security" (2007) 10:6 Public Health Nutrition 566 at 568.

[168] *Ibid* at 567.

In form and tone, these agreements signify

> that Canada has agreed to work within an international human rights framework and has an obligation to take steps to respect and fulfil such rights. This creates moral, legal and ethical imperatives to bring this human rights framework home by developing a domestic food policy infrastructure based on the right to food.[169]

Notwithstanding its longstanding appearance of commitment, Canada has yet to achieve a state of food security "despite strong economic growth in the past decade and a comprehensive *Charter of Rights and Freedoms*, with which food security could be embedded into a domestic human rights framework."[170] It has been argued that the domestic incorporation and implementation of a framework that upholds the primacy of the human right to food is forestalled for the following four reasons. First, nutritional health concerns are given "secondary consideration in the overall design of the food and agriculture system."[171] Second, the human right to food has neither been upheld nor granted significant weight by courts who "are in a position to give legal precedent in upholding the right to food under the auspices of the *Charter*, the *Universal Declaration of Human Rights* and the *ICESCR*."[172] Importantly,

> [h]uman rights obligations would have little meaning if the duty bearers could not be held accountable to rights holders and to society at large. Such accountability is put into practice through several institutions and processes…Judicial and quasi-judicial accountability are established through legislation, its implementation and, in the final instance, the ability of a free and independent judiciary or quasi-judicial body to uphold the law through the effective enforcement of judicial pronouncements, thus supporting both the separation and balance of power.[173]

Third, Canada adopts a non-comprehensive and disjunctive approach to food and nutrition policy discourse as food, nutrition, agriculture and trade policies are considered as standalone factors. This hinders the development of an effective and comprehensive food policy that crosses territorial and provincial borders.[174] Fourth, the lack of political will to uphold the human right to food in Canada runs afoul of its declared commitment.[175]

As argued previously, the common thread underlying land grab activities, land use change practices, exponentially increasing food prices, greenhouse

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[169] *Ibid*.

[170] *Ibid* at 566. See *Canadian Charter of Rights and Freedoms*, Part I of the *Constitution Act, 1982*, being Schedule B to the *Canada Act 1982* (UK), 1982, c 11 [*Charter*].

[171] Rideout, *supra* note 167 at 568.

[172] *Ibid*.

[173] FAO, "Justiciability", *supra* note 165 at 71. See also Gargi Dutta, "Justiciability of Right to Food" (2015) 5:1 Intl J Scientific & Research Publications at 1.

[174] FAO, *Right to Food in Practice*, *supra* note 166 at 570-571. See also Centre for Urban Health Initiatives Research Interest Group, "Key Barriers and Strategies to the Implementation of Food Security Policy Project Summary for the 3rd National Food Security Assembly", online: Ryerson University <www.ryerson.ca/content/dam/foodsecurity/projects/paperspres/MobilizingFoodSecurity2pdf.pdf>.

[175] Rideout et al, *supra* note 167 at 571.

gas emissions and climate change is the application of agro-biofuel technology. The ensuing consequences, compounded by the reluctance of states to either domestically implement or devise an international regime specific to agro-biofuel technology that clearly accounts for and upholds the human right to food, supports the proposition that agro-biofuel technology should be restrictively regulated.

Accordingly, an international framework is proposed with the object of re-prioritizing the right to food in the agro-biofuel technology discourse. In doing so, it will strive to conform with General Comment 12 of the *ICESCR* that establishes "a three-level typology of states' obligations"[176]:

> The duty to *respect* the right to food is essentially a duty of non-interference with existing access to adequate food. It requires States Parties to refrain from measures that prevent such access. The duty to *protect* the right to food requires States Parties "to ensure that enterprises or individuals do not deprive individuals of their access to adequate food." The duty to *fulfill* the right to food is a positive obligation that the CESCR has interpreted to include the duty to facilitate and to provide.[177]

As succinctly articulated by the FAO:

> States have the obligation to "respect, protect and fulfil"; that is, first, the state must not itself deprive anyone of access to adequate food; second, it must protect everyone from being deprived of such access in any other way; and third, when anyone is in fact without adequate food the state must proactively create an enabling environment where people become self-reliant for food or, where people are unable to do so, must ensure that it is provided. *Every individual is a rights-holder, fully entitled to demand that the state perform these duties.*[178]

The proposed legal framework will play a significant role in the fight against hunger as "legal frameworks and national strategies are as vital as technical tools, and participatory institutions or processes as important as investments, *if we assess success in the long term*."[179] As noted earlier, the proposed framework is grounded in the OECD Checklist. The checklist, which enumerates ten factors to consider when making regulatory decisions, "can be applied at all levels of decision- and policy-making."[180] As an example, when one should

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[176] Smita Narula, "Reclaiming the right to food as a normative response to the global food crisis" (2010) 13 Yale Human Rts & Dev LJ 403 at 406.

[177] *Ibid*. See also Schutter, "The Emerging Human Right", *supra* note 49 at 305: "the right to food primarily requires that States abstain from measures that may deprive individuals from the access to productive resources which they depend on when they produce food for themselves (obligation to respect); that they protect such access from encroachment by other private parties (obligation to protect); and that they seek to strengthen people's access to and utilization of resources and means to ensure their livelihood, including food security (obligation to fulfil)."

[178] FAO, *Right to Food in Practice*, *supra* note 166 at 2 [emphasis added].

[179] Olivier de Schutter, "Countries Tackling Hunger With a Right to Food Approach: Significant Progress in Implementing the Right to Food at National Scale in African, Latin America and South Asia" (2010) at 2, online: <www2.ohchr.org/english/issues/food/docs/Briefing_Note_01_May_2010_EN.pdf> [emphasis added].

[180] OECD Checklist, *supra* note 25.

consider whether the problem is correctly defined,[181] whether regulation is the best form of government action,[182] or whether the benefits of regulation justify the costs.[183]

A. International Framework: Three-Tiered Regime

The impacts of agro-biofuel technology practice in one jurisdiction are not locally confined but are rather felt by nations across the globe. National legislation would, therefore, be ill-equipped to thoroughly address right-to-food violations that transcend borders; this in turn justifies looking to an international regulatory framework. The rationalization for such a regime is three-fold. First, simply looking to the environmental objectives of current policies alone justifies the need for an international regime since "local environmental change, whether driven by local or international activities, can affect processes of ecological change in other distant regions and compromise those regions' economic, social, and ecological sustainability."[184] Second, when considering food prices, there exists an interconnectivity and interdependence between the nations in the global north and south as food price fluctuations, in conjunction with agro-biofuel technology application, impact the global food market.[185] Third, predominantly northern private and public entities have engaged in land acquisition transactions abroad, notably in the global south. In doing so, the north has provoked land use changes that further hinder the realisation of the right to food.

The three-tiered international framework proposed by this article will dictate whether a given jurisdiction should or should not engage in adopting agro-biofuel technology practices with an eye towards preventing right-to-food violations. To come to a positive determination, the first two tiers of the framework must both be satisfied. In other words, if the analysis fails at the first tier, the examination does not proceed and the state will be required to reject the request to engage in agro-biofuel practice.

i. First Tier: Determinative Factors Establishing Whether a State Shall Engage in Agro-Biofuel Technology Application

In light of the compounded detrimental effects of agro-biofuel technology application that leaves the right-to-food unrealized, as studied in the first half of this article, an examination of the following factors will ultimately determine whether a state will be permitted to employ agro-biofuel technology within its jurisdiction or abroad. This examination of the enumerated factors is

[181] *Ibid*. question 1.
[182] *Ibid*, question 3.
[183] *Ibid*, question 6.
[184] Kissinger, Rees & Timmer, *supra* note 132 at 966.
[185] *Ibid* at 968.

dependent on the jurisdiction where the agro-biofuel technology application is to take place. The analysis is also cumulative. In other words, if a single factor is left unfulfilled, the state desiring to deploy agro-biofuel technology will be prohibited from doing so until the requirements of the unfulfilled factor, considered in concert with a re-analysis of all the other factors, is met. The determinative factors are as follows.

a. Food Security

According to the 1996 World Food Summit, the "state of food security" can, be defined as "a situation in which all people *at all times have physical and economic access to sufficient, safe and nutritious food* to meet their dietary needs and food preferences for an active and healthy life...The opposite of food security is food insecurity."[186] Following an analysis of food security indicators and measures[187], the jurisdiction in which a state seeks to practice agro-biofuel technology *must* be declared food secure otherwise agro-biofuel technology application will be denied.

b. The Right to Food

The second criteria of the proposed regime would seek to ensure that the right to food is respected in a jurisdiction; such a goal would necessitate supervision and regulation of the use of agricultural land. To achieve this, states would be required to review and, if necessary, amend existing legislation, as well as prohibit activities from non-state actors "that may deprive individuals of access to *productive resources* [including agricultural lands] on which they depend when they produce food".[188] As a result, if these lands are being converted through land use change or land grabbing practices, either within the requesting state's jurisdiction or abroad, the requesting state would be in contravention of its obligation to respect the right to food and would consequently be barred from engaging in agro-biofuel technology practices.

As discussed above, the majority of land acquisition transactions escape public scrutiny. Therefore, under this regime, land-transfer agreements should be subject to government oversight to ensure that lands are not diverted for purposes other than the production of food for domestic consumption. This can be achieved by establishing a regime in which the state is a *de facto* party to land-transfer agreements. Understandably, numerous concerns arise regarding competing land title and tenure interests as well as the potential of abuses when granting the state an interest in land. However, to mitigate these potential problems, the state's role in land acquisition agreements can

[186] Blakeney, *supra* note 109 at 2 [emphasis added].

[187] See also Benjamin Davis, S S Acharya & Basudeb Guha-Khasnobis, eds, *Food Security: Measurement, Indicators, and the Impact of Trade Openness* (Oxford: Oxford University Press, 2007).

[188] Olivier De Schutter, *Interim Report of the Special Rapporteur on the Right to Food*, UNGA 65th Sess, Annex Agenda Item 69 (b) UN Doc A/65/281 [Emphasis added].

be limited to a significant, yet singular, interest among the bundle of rights accorded to the land title holder.[189] The interest or title thus conferred to the state will immerse the state in all transactions and will consequently permit the state to exert the required oversight to ensure that its tripartite obligations rooted in the human right to food are realised.

Admittedly, this proposed measure would require a substantial change to the land title and tenure system in many states. Undeniably, as drastic as the proposed change may appear, the decision of the states to *voluntarily* implement such measures would be justified by the human right to food, an enshrined right in a range of international legal instruments that include the *UDHR*.[190] In doing so, the long-term objective of upholding the human right to food would be attained once states adopt a supervisory role in land transfer agreements for the following five reasons. First, in the event that the state is a party to a land acquisition agreement, it will engage in self-governance and will be required to abstain from engaging in agreements "that may deprive individuals from the access to productive resources which they depend on when they produce food for themselves".[191] Second, land transfer agreements between private entities will hereafter involve the state whose obligation will be to inspect the agreement in light of the proposed factors and subsequently approve or deny the transaction. For instance, if two private entities were to purchase a piece of land to continue the existing agricultural practices aimed at cultivating food for local use, the state will have no grounds for denial. However, a refusal would be justified if agricultural land use were to be diverted for export purposes. Third, in exercising its power of oversight, the state simultaneously will meet its obligations under the *UDHR* and *ICESCR* to "seek to strengthen people's access to and utilization of resources and means to ensure their livelihood, including food security."[192] Fourth, conferring an interest in land will transform the state's involvement in land transactions from a passive backbencher to an active, accountable actor, resulting in state involvement and interaction with the various stakeholders and allowing the state to safeguard the right to food.[193]

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[189] The FAO argues that "[i]n practice, multiple rights can be held by several different persons or groups. This has given rise to the concept of "a bundle of rights". Different rights to the same parcel of land, such as the right to sell the land, the right to use the land through a lease, or the right to travel across the land, may be pictured as "sticks in the bundle". Each right may be held by a different party. The bundle of rights, for example, may be shared between the owner and a tenant to create a leasing or sharecropping arrangement allowing the tenant or sharecropper the right to use the land on specified terms and conditions." FAO Land Tenure Service, *Land Tenure and Rural Development* (Rome: FAO, 2002) at 9, online: <ftp://ftp.fao.org/docrep/fao/005/y4307E/y4307E00.pdf> [FAO, *Land Tenure*].

[190] *UDHR*, *supra* note 27.

[191] Schutter, "The Emerging Human Right", *supra* note 49 at 305.

[192] *Ibid*.

[193] Christian Courtis argues that "the right to food involves the existence of a multiplicity of actors: right-holders, but also private actors, especially those who produce and distribute food, those who are involved or can affect the means for the procurement of food, and of course the state." Christian Courtis, "The Right

Lastly, other numerous trickle-down advantages in the realm of property rights will follow when the human right to food is prioritized by immersing the state into land transactions. For instance, "weak land governance and poor recognition of local land rights"[194] can effectively be countered since the

> failure to map and record land rights, even if only at the community level, makes it difficult to identify boundaries and legitimate owners as a basis for engaging in mutually agreed to land transfers. *Recording rights provides outside investors with "somebody to talk to," a legitimate and authorized partner to negotiate on the nature of investments and on compensation. A formal record is also very much in investors' interest as it reduces the scope for fraudulent transactions and the need for costly inquiry to prevent the surfacing of possible undisclosed prior claims or overriding interests (such as land use restrictions).*[195]

The examination of land title (re)organization and land rights reform mechanisms fall outside the substantive scope of this article; however, the possibility of achieving a workable land titles framework that includes and considers fulfilling the right to food is not an ephemeral idea. The following statement from the World Bank is indicative of the possibility:

> It is possible to register group rights in a way that allows for community management of basic land administration processes (such as allocation of individual rights, updating of registries, and other internal affairs, according to given bylaws).
>
> Boundaries are recorded and a clear internal governance structure (with internal control structures) is established to allow interaction with outsiders.
>
> Records are integrated with those used in the regular land administration system to prevent double-allocation of land, to allow land users to enter into joint ventures with investors, or to allow groups to gradually individualize land rights if desired.
>
> Relevant secondary rights, including use rights to land and associated natural resources, such as those held by pastoralists, migrants, and forest dwellers, are recorded and protected, rather than eliminated or ignored, for example, by documenting them in land use plans that identify cattle tracks, seasonal grazing areas, and watering sources.[196]

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to Food as a Justiciable Right: Challenges and Strategies" (2007) 11:1 Max Planck Yearbook United Nations L Online 317 at 324.

[194] Deiniger, *supra* note 1 at 49. See also FAO, *Land Tenure*, *supra* note 189: "An enforcement or protection component is essential to effective land administration since rights to land are valuable when claims to them can be enforced. Such a component allows a person's recognized rights to be protected against the acts of others. This protection may come from the state or the community through social consensus as described below in the section on "Tenure Security". A stable land tenure regime is one in which the results of protective actions are relatively easy to forecast. In a formal legal setting, rights may be enforced through the system of courts, tribunals, etc. In a customary tenure environment, rights may be enforced through customary leaders. In both cases, people may be induced to recognise the rights of others through informal mechanisms such as community pressures. People who know their rights, and know what to do if those rights are infringed, are more able to protect their rights than those who are less knowledgeable."

[195] Deiniger, *supra* note 1 at 98 [emphasis added].

[196] *Ibid* at 101.

Moreover, potential abuses of this proposed oversight power could be remedied by the mechanism of judicial review, with an initial decision made at the national level and an appeal route to an international adjudicative body since, simply put, "[w]ithout the means of enforcement there can be no real right."[197] Therefore, analogous to an administrative body, a quasi-judicial board could reassess the grounds on which the state rendered its initial decision.[198] Through this mechanism, states would be held accountable and responsible for ensuring that the human right to food is fulfilled.

c. Availability of Alternative Viable Energy Sources

Another determinative factor to be considered as part of this article's proposed regulatory regime would be the availability of viable alternative energy sources. This regime would have to consider whether the requesting state has access to other viable alternative energy sources, either through local production or importation. If the requested state has access to other forms of energy, the regime's analysis would tend towards declining the application to engage in agro-biofuel technology practices.

d. Agricultural Land Availability Categorically Excluding Forest or Protected Lands

Inspired from a European "proposal for a directive on the promotion of the use of energy renewable sources"[199], the proposed regime would implement the two policies articulated by this proposal, which would effectively address concerns regarding the interplay between land use change, greenhouse gas emissions and biodiversity loss. This proposal suggests that "land with high carbon stocks … [and] high biodiversity should not be converted for biofuel production."[200]

e. Favorable Climate Conditions

The final factor of this proposed regime recognizes that weather conditions and agriculture are interdependent. Numerous studies on weather risk management have been conducted to assess the impact of various weather conditions on crop yields and it is argued that "[e]xtreme weather events, and climate anomalies, have major impacts on agriculture. Of the land annual crop losses in world agriculture, many are due to direct weather and climate effects such as drought, flash floods, untimely rains,

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[197] Dutta, *supra* note 173 at 1.

[198] Dutta argues that "Jean Dreze defines justiciability of the right to food as the possibility that a recognised human right can be invoked before a judicial or quasi judicial body which can determine as to whether the right has been violated and recommend appropriate measures in case of violation. The justiciability is the ability of the judiciary or the quasi-judicial authority to uphold the law through effective judicial pronouncements" (*ibid*).

[199] Office of Policy Analysis, *supra* note 2 at 48.

[200] *Ibid*.

frost, hail, and storms."[201] The proposed regime would, essentially, not allow a state with less than favorable weather conditions to engage in agro-biofuel production. This is because food crops yields would have already suffered from the adverse weather conditions, already quantitatively and qualitatively jeopardizing food sufficiency.

Once all of the determinative factors in this tier of the regime have been analysed in the jurisdiction where the proposed agro-biofuel technology is to be practiced, the state would be required to either permit or deny the application of the technology. In the event that its assessment renders a positive response, the requirements of the second tier of this regime would need to be met. This tier requires that the state ensure that all concerned and effected parties have been consulted and that prior informed consent was granted.

ii. Second Tier: Prior Informed Consent

The second tier of this proposed regime would seek to ensure that all stakeholders in a parcel of land and its produce would need to provide prior informed consent before agro-biofuel production would be allowed. This requirement would provide an additional level of protection for the right to food. Stemming from the aforementioned lack of transparency regarding land acquisitions, there is a potential for power imbalances between the parties negotiating land acquisitions in either foreign nations or domestically.[202] In response to the clandestine manner in which these agreements have been reached in the past, the proposed framework would require prior informed consent from land owners and title holders, possessors and lessors, local communities and indigenous peoples before a land transfer is approved for agro-biofuel practice. This approach will ensure that their concerns, including food availability and accessibility, are voiced and considered. Importantly, to ensure successful long-term implementation of an oversight system such as this one, the revised land tenure regime alluded to above should pre-emptively account for the possibility of de facto realities, such as poor governance, weak institutions and low human capabilities from weakening the purpose, applicability and efficiency of the proposed system.

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[201] John Hay, "Extreme Weather and Climate Events, and Farming Risks" in Mannava V K Sivakumar & Raymond P Motha, eds, *Managing Weather and Climate Risks in Agriculture* (New York: Springer, 2007) 1 at 1.

[202] Aryeetey and Lewis state that "[m]any reports describe unbalanced power relationships where rich governments or international companies have an obvious advantage in negotiating with African nations that may not always be politically stable or *respectful of the rights of their citizens* and may lack the institutional frameworks necessary to enforce contracts. Ernest Aryeetey & Zenia Lewis, "African Land Grabbing: Whose Interests are Served?" (27 June 2010), online: Brookings Institute <www.brookings.edu/articles/african-land-grabbing-whose-interests-are-served> [emphasis added].

iii. Third Tier: Regulating Permitted Agro-Biofuel Technology Practices

Upon passing the first two tiers of this proposed regime, the state would grant approval for agro-biofuel technology practice within its jurisdiction. Even with this approval, the permitted agro-biofuel practice will still be subject to government regulation, control and surveillance. This article will discuss three potential forms of regulation below.

a. Contextual Crop-Type Analysis

As alluded to throughout this paper, first generation agro-biofuels can be generated from a myriad of crop types, each possessing a variety of characteristics ranging from reduced to tolerable greenhouse gas emissions, water consumption requirements, decreased utilization of agro-chemicals, such as fertilizers or herbicides, and the surface area required to achieve a specified production yield.[203] A crop type analysis can thus be conducted to determine which feedstock, relative to the particular context of the jurisdiction, should be cultivated for agro-biofuel technology practice. A significant variable that governments should consider in this contextual feedstock utilization assessment is the coincidence of first generation agro-biofuels with staple edible food crops. In addition to enumerating crop types for agro-biofuel technology application, the state could also prohibit staple crops from being grown for agro-biofuel technology purposes. Such precautions have already been implemented, for instance, in "China and India [which] have discouraged the use of food crops, and prime farm land for biofuel production."[204]

b. Application of Single or Multiple Steps Within the Overall Agro-Biofuel Production Process

Since the agro-biofuel production chain involves numerous stages, each of which independently emit greenhouse gases, the overall process of producing agro-biofuel can be divided into distinct procedural steps and potentially be implemented in multiple jurisdictions. Depending on a jurisdiction's circumstances and agro-biofuel industrial infrastructure, a state may choose to approve a single stage, a combination of stages or the entire process. The separation of the steps of agro-biofuel production has the potential to spread the greenhouse gas emissions amongst numerous states as opposed to having every jurisdiction engage in the overall agro-biofuel production process and emitting substantial quantities of greenhouse gas domestically, thus potentially facilitating meeting greenhouse gas reduction targets. Additionally, farming-level strategies and designs can assist in further tailoring the chosen procedural step to more effectively minimize greenhouse

[203] Saharah Moon Chapotin & Jeffrey D Wolt, "Genetically Modified Crops for the Bioeconomy: Meeting Public and Regulatory Expectations" (2007) 16:6 Transgenic Research 675.
[204] Office of Policy Analysis, *supra* note 2 at 47.

gas emissions. Specifically, McRae identifies "farm-and system-level changes that bring about greater efficiency and reduced [greenhouse gas] emissions."[205] For instance, upon synthesizing numerous studies on organic farming systems, which opt out of utilizing synthetic fertilizers and pesticides, and conventional farming systems, which heavily rely on the latter chemical products, studies highlight that corn-soybean-wheat organic farming systems incurs a differential of 73 net Global Warming Potential, which is "a method for comparing the potential of emissions of different greenhouse gases"[206] that "has been adopted as an instrument in the Kyoto Protocol of the United Nations Framework Convention on Climate Change"[207], in comparison to conventional tillage farming processes.[208] Simply put, organic farming systems have a considerably lower Global Warming Potential than their conventional counterparts. Accordingly, regulated agro-biofuel production processes should be designed to incorporate farming-system strategies that have proven to minimize greenhouse gas emissions.

c. Ensuring Compliance Established Regulations and Measures in Cases of Contravention[209]

Albeit a considerable and costly undertaking, to ensure compliance with the regulatory framework that prioritizes the human right to food, states should survey the agricultural practices that are occurring in their jurisdictions by conducting regular and spontaneous inspections. In addition, states could also impose practice reporting obligations upon the parties to a land transfer agreement, as well as the parties required to provide prior informed consent. In support of these reporting obligations, the state can establish or transpose existing incentives and agro-biofuel promotional programs, such as subsidies or tax exemptions, to promote reporting obligations.

In the event that land practices are found to contravene national legislation, thus encroaching on the right to food, the state must impose severe sanctions to deter further contravening practices. For instance, the state may impose monetary

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[205] McRae, Lynch & Martin, *supra* note 69 at 551.

[206] Keith P Shine et al, "Alternatives to the Global Warming Potential for Comparing Climate Impacts of Emissions of Greenhouse Gases" (2005) 68 Climatic Change 281 at 281; See also: United States Environmental Protection Agency, "Greenhouse Gas Emission: Understanding Global Warming Potentials", online: <www.epa.gov/ghgemissions/understanding-global-warming-potentials>: "The Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO2). The larger the GWP, the more that a given gas warms the Earth compared to CO2 over that time period. The time period usually used for GWPs is 100 years. GWPs provide a common unit of measure, which allows analysts to add up emissions estimates of different gases (e.g., to compile a national GHG inventory), and allows policymakers to compare emissions reduction opportunities across sectors and gases."

[207] Keith P Shine et al, *supra* note 206 at 282.

[208] McRae, Lynch & Martin, *supra* note 69 at 556–57.

[209] OECD Checklist, *supra* note 25, question 10: How will compliance be achieved?

sanctions in the form of damages, completely prohibit agro-biofuel technology from any further application, restore the land to purely agricultural cultivation of edible foods, or acquire possession of the lands in question as well as the feedstock being produced. The land and any proceeds incurred from selling the agro-biofuel produce can then be redistributed to the local communities.

B. Canada: To Practice or Not to Practice Agro-Biofuel Technology?

The Canadian government supports agro-biofuel production. In 2010, the Canadian government mandated, through the adoption of the *Federal Renewable Fuel Regulations*,[210] that gasoline should be, on average, a five percent renewable fuel blend.[211] In support of this regulatory objective, numerous government agencies, notably Natural Resources Canada and Sustainable Development Technology Canada, have provided substantial funding[212] "to encourage biofuel production."[213] The following section will question and investigate whether the investment in agro-biofuel technology in Canada is justified in light of the proposed international framework. The same analysis would also apply in the case where a foreign state or foreign private entity seek to practice agro-biofuel technology within Canadian jurisdictions.

i. First Tier: Public and Private Entities—Are they Permitted to Engage in Agro-Biofuel Technology Application in Canada?

a. Food Security: Is Canada Food Secure?

In 2012, the Special Rapporteur on the right to food examined "the way in which the human right to adequate food is being realized in Canada"[214] and declared that Canada was in a situation of food insecurity since

> [a] growing number of people across Canada remain unable to meet their basic food needs. In 2007/2008, 7.7 per cent of households reported experiencing moderate or severe food insecurity, approximately 1.92 million people, aged 12 or older, lived in food-insecure households and a staggering one in 10 families, with at least one child under the age of six, were food insecure.[215]

In light of this assessment, Canada would be precluded from engaging in agro-biofuel technology application on the basis of food insecurity alone.

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[210] *Renewable Fuel Regulation*, *supra* note 22.
[211] Natural Resources Canada, *supra* note 24.
[212] *Ibid*.
[213] Canada, Parliamentary Information and Research Service of the Library of Parliament, "Biofuels: An Energy, Environmental or Agriculture Policy?" by Frédéric Forge, PRB 06-37E (8 February 2007) at 3 [Forge, "Biofuels"].
[214] *Report of the Special Rapporteur on the Right to Food*, Olivier De Schutter, OHCHR, 22nd Sess, UN Doc A/HRC/22/50/Add 1, (2012) at para 1 online: <www.ohchr.org/Documents/HRBodies/HRCouncil/RegularSession/Session22/AHRC2250Add.1_English.PDF>.
[215] *Ibid* at para 6.

b. Right To Food: Is the Right to Food Respected in Canada?

In 2016, the Chief Public Health Officer conducted an investigation on the health status of Canadians and factored food security into its assessment. Of note, it stated that "[i]n, 2011-2012 more than 1 million or just under 1 in 10 Canadian households were living with moderate to severe food insecurity."[216] Furthermore, this report particularly highlighted that "[i]n 2008/2010, 54% First Nations on-reserve households reported being either moderately or severely food insecure."[217] In 2012, another study was pioneered by the Canadian Institute of Health Research and PROOF: Research to Identify Policy Options to Reduce Food Insecurity, "an international, interdisciplinary team of researchers committed to a program of research to identify effective policy interventions to address household food insecurity"[218], in which it jointly collaborated to pursue a Pan-Canadian study with the objective of understanding and determining "the prevalence, distribution and relative severity of household food insecurity across the country."[219] Interestingly, the report extracted and relied upon data from Statistics Canada[220] to "present estimates of the number of adults and children living in food insecure households in Canada and the rate of household food insecurity among children"[221]. The numbers are as follows:

> In 2012, 12.6% of Canadian households or 1.7 million households representing 2.8 million adults and 1.15 million children under the age of 18, experienced some level of food insecurity during the previous 12 months. This means that 16.5% of children under 18, or about one in six, lived in households that experienced food insecurity during 2012.
>
> The levels of deprivation documented were substantial, with 6.0% of households (i.e., 786,100 households) classified as moderately food insecure, indicating compromises in the quality and possibly quantity of food consumed over the past 12 months, and 2.6% (i.e., 336,700 households) severely food insecure, reporting clear indications of food deprivation among household members.
>
> Household food insecurity has risen significantly since 2008, and since 2011 an additional 130,000 Canadians were living in food insecure households, bringing the national total to over 4 million people (4,005,000) and a prevalence of 12.5%.
>
> Food insecurity rose from 36.4% to 45.2% in Nunavut from 2011 to 2012, although this difference is not statistically significant. The Northwest Territories, where the

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[216] Public Health Agency of Canada, "Health Status of Canadians 2016", online: <www.healthycanadians.gc.ca/publications/department-ministere/state-public-health-status-2016-etat-sante-publique-statut/alt/pdf-eng.pdf> at 30.

[217] *Ibid*.

[218] Valerie Tarasuk, Andy Mitchell & Naomi Dachner, "Household Food Insecurity in Canada" (2012) at 1, online: <nutritionalsciences.lamp.utoronto.ca/wp-content/uploads/2014/05/Household_Food_Insecurity_in_Canada-2012_ENG.pdf>.

[219] *Ibid* at 5.

[220] Statistics Canada, "Household Food Insecurity, 2011-2012", online: <www.statcan.gc.ca/pub/82-625-x/2013001/article/11889-eng.htm>

[221] Tarsuk, Mitchell & Dachner, *supra* note 218 at 7.

> second highest prevalence in the country was found, also experienced an increase in food insecurity from 2011 to 2012 (15.2% to 20.4%). Continuing from 2011, food insecurity rates also topped 15% in the Maritimes and the Yukon in 2012…
>
> In 2012, 84% of the food insecure households in Canada, 1.4 million, were located in Ontario, Quebec, Alberta, and British Columbia, Canada's most populous provinces.[222]

In addition, as discussed above, the Special Rapporteur concluded that "[w]hile the great majority of the Canadian population enjoys the right to adequate food and is afforded the right to social security, a significant segment of society does not."[223] Using these studies, it can be posited that not only has food insecurity existed in Canada, since a fraction of Canadian households have been declared food insecure, it has persisted since 2007 and 2008. As such, the right to food criteria is not met.

c. Availability of Alternative Viable Energy Sources: Does Canada Possess Viable and Alternate Energy Sources?

Canada claims to possess "a vast and diversified portfolio of energy sources",[224] and as such, would likely be precluded from engaging in agro-biofuel production under the proposed regime.

d. Agricultural Land Availability Categorically Excluding Forest or Protected Lands: Would Canada's Agricultural Land be Compromised?

Estimates suggest that to meet the biofuel blend target of 5%, 4.6 million tonnes of corn, 2.3 million tonnes of wheat and 0.56 million tonnes of canola would be required.[225] In addition, "[i]f all these feedstocks were grown domestically, they would represent 48-52% of the total corn seeded area, 11-12% of the wheat seeded area and about 8% of the total canola seeded area".[226] Lastly, to achieve the objective of converting 10% of the fuel presently in use for transportation, 36% of Canadian farmland would need to be dedicated to agro-biofuel production.[227] These statistical estimates, therefore, strongly undermine the "rationale for allocating farmland production to energy rather than food production."[228]

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[222] *Ibid* at 8–9.
[223] DeSchutter, *supra* note 214 at para 31.
[224] Natural Resources Canada, "Additional Statistics on Energy" (4 March 2013), online: <www.nrcan.gc.ca/publications/statistics-facts/1239>: "Canada relies on a mix of secure and reliable energy sources such as oil, natural gas, hydro-electricity, uranium for nuclear power generation, and coal." Natural Resources Canada, "Energy Sources" (18 December 2013), online: <www.nrcan.gc.ca/energy/sources/12414>.
[225] Forge, , *supra* note 213 at 5.
[226] *Ibid*.
[227] *Ibid*.
[228] *Ibid*.

e. Favorable Climate Conditions: Is Canada's Climate Adequate for Agricultural Production Yields?

Generally, the Canadian agricultural industry can be characterized as effectively operating and cycling between a non-growing cooler season, spanning roughly October to April, and an active and warmer season, spanning May to September. As such, the window within which the Canadian agricultural industry can engage in farming practices is relatively short in comparison to other dominant agricultural economies that benefit from a longer active cycle. In spite of this oversimplification of Canada's rather limited agricultural seasonal *ouverture*, it nonetheless supports the argument that, during the relatively shortened active period, diverting farmland from food growth to agro-biofuel crop production is not justified as production levels and outputs are directly dependent on, and proportional to, the duration of the agricultural season.

Undeniably, climate change and the instability it causes also impacts production yield outputs.[229] In fact, the 2015 Annual Review of Agroclimate Conditions Across Canada,[230] a statistical and analytical review conducted by the Government of Canada that reports on weather conditions and the resulting "agroclimate impacts across Canada during the 2015 growing season",[231] states that Canada's 2015 agriculture and growing season was riddled with climate instability that "resulted in a challenging growing season".[232] Furthermore, the review concluded that "[d]amage from spring frosts, a severe drought, and rain during harvest reduced crop yields and quality".[233] The Agriculture and Agri-Food Canada sector of the Government of Canada also reiterated this concern when stating that:

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[229] The FAO argues that "[c]limate change is profoundly impacting the conditions in which agricultural activities are conducted. In every region of the world, plants, animals, and ecosystems are adapted to the prevailing climatic conditions. When these conditions change, even slightly, even in a direction that could seem more favourable, the plants and animals present will be impacted, some will become less productive, or even disappear. Some of these impacts can be easily predicted, like the direct impact of a heat wave on a specific plant at a specific moment of its growth (provided that it has been well studied enough). Others are more complex to predict, like the effect of a certain climatic change on a whole ecosystem, because each element will react differently and interact with the other. For instance, many cultivated plants react favourably, in controlled conditions, to an increase of CO2 in the atmosphere. But at the same time many weeds also react favourably. The result, in the field, can be an increase or decrease in yield of the cultivated plant depending on weeds competing for nutriments and water and on remedial agricultural practices." FAO, "Climate Change and Food Security: Risks and Responses" (2016), online: FAO <www.fao.org/3/a-i5188e.pdf> at 3. Deiniger argues that "[c]limate change will have profound impacts on agricultural production in several ways. While higher temperatures may allow crop cultivation to expand into areas that have traditionally been too cold for crop cultivation, it is likely to reduce yields in hotter climates. *Experts also agree that with climate change extreme weather events are likely to create higher variability of output*." Deiniger, *supra* note 1 at 15 [emphasis added].

[230] Agriculture and Agri-Food Canada, "2015 Annual Review of Agroclimate Conditions Across Canada", online: <www.agr.gc.ca/resources/prod/doc/pdf/agroclimate_ar_2015-en.pdf>.

[231] *Ibid* at 1.

[232] *Ibid*.

[233] *Ibid*.

> one of the concerns is that climate change could have significant negative impacts including the increased intensity and frequency of droughts and violent storms.
>
> *As the frequency of events like droughts increases under climate change, crop yields would decrease.*[234]

Also, the creeping rise in temperature, a primary and ensuing consequence of climate change,[235] has raised concerns in most, if not all, Canadian provinces that "[c]limate change could continue to pose risks to individual farming enterprises, regional agricultural sectors, and rural communities."[236] The Ontario Centre for Climate Impacts and Adaptation Resources succinctly summarizes the potential consequences on agriculture that result from the constantly changing climate and the linked rise in temperature as follows:

> Research has shown that the growing season has been getting longer and warmer over most areas of agricultural land in Canada. *Although the warming trend is seen as a future benefit to the sector, research suggests that a decrease in water availability over the growing period may be the major limiting factor for future crop production.*
>
> Warmer temperatures and a longer growing season could benefit many crops including corn, soybeans, forages and horticultural crops, *but climate change could pose significant risks including changes in drought frequency and severity, shifts in the timing of precipitation and changes in storm intensity present risks to production.*[237]

Clearly, climate change caused by greenhouse emissions has occasioned disruptions in weather patterns and predictability as "[g]lobal and regional weather conditions are also expected to become more variable than at present, with increases in the frequency and severity of extreme events such as cyclones, floods, hailstorms, and droughts."[238] As agricultural practices depend on weather conditions, crop production yields are potentially threatened. As a result, stable food yields, and, therefore, a stable food supply, are not ensured due to the highly variable and unfavourable climate to which

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[234] Agriculture and Agri-Food Canada, "Impact of Climate Change and Canadian Agriculture", online: <www.agr.gc.ca/eng/science-and-innovation/agricultural-practices/agriculture-and-climate/future-outlook/impact-of-climate-change-on-canadian-agriculture/?id=1329321987305> [emphasis added].

[235] Government of Canada, "Impact of Climate Change and Canadian Agriculture"(27 November 2015), online: Statistics Canada <www.statcan.gc.ca/pub/16-002-x/2011001/part-partie2-eng.htm>: "Analysis of the national annual mean temperature departure from normal time series…shows a warming trend over the period 1948 to 2009. The linear trend for annual mean temperature departures between 1948 and 2009 moved above the 1961 to 1990 normal beginning in 1973. The linear trend indicates an increase in mean temperature of 1.4°C over the 62 years in the record."

[236] Ontario Centre for Climate Impacts and Adaptation Resources, "Agriculture: In a changing climate", online <www.climateontario.ca/doc/factsheets/Agriculture-final.pdf>.

[237] *Ibid* [emphasis added].

[238] Josef Schmidhuber & Francesco N Tubiello, "Global Food Security Under Climate Change" (2007) 104:50 Proceedings National Academy Sciences United-States America 19703 at 19704, online: <www.ncbi.nlm.nih.gov/pmc/articles/PMC2148361/pdf/zpq19703.pdf>.

the implementation of agro-biofuel technology is a contributing factor.[239] In light of the limited growing season and the compounding effects of climate change, Canadian agricultural practices should consequently have food crop production as their focal point.

C. First Tier Assessment

Succinctly, Canada would be precluded from agro-biofuel technology application since none of the factors weigh in favour of permitting agro-biofuel technology application and the analysis does not proceed past at the first stage.

IV. Conclusion

In response to oil crises of the past and the growing concern of fossil fuel's eminent scarcity, nations across the globe have sought to secure alternative energy sources. In doing so, they have focused on edible foods, which are believed to be a limitless and indefinitely regenerative energy source. In the quest for energy security and independence, nations have fervently engaged in agro-biofuel technology practices, both domestically and abroad, spurring the food versus fuel debate in agricultural production. Environmental concerns, such as the mitigation of greenhouse emissions and climate change, and developmental concerns, such as rural development, are the grounds by which states justify the adoption of policies supporting agro-biofuel technology. In doing so, states have turned a blind eye to the consequences that have arisen from agro-biofuel technology practices, such as the global land grab phenomenon as well as land use change, increased food prices and adverse environmental consequences. As such, the fundamental human right to food is jeopardized by agro-biofuel technology applications. To reprioritize this human right, a three-tiered international framework is proposed where states will be granted or denied permission to pursue agro-biofuel technology undertakings either domestically or abroad. Since the right to food has been gravely undermined by agro-biofuel technology, the benefits of regulation will undoubtedly outweigh the costs in the hopes of countering food insecurity and the violation of the human right to food.

[239] Schmidhuber and Tubiello argue that "[c]limate change affects agriculture and food production in complex ways. It affects food production directly through change in agro-ecological conditions and indirectly by affecting growth and distribution of incomes, and thus demand for agricultural produce" (*ibid* at 19703).