The London School of Economics and Political Science

A Legal Inquiry into Hunger and Climate Change: Climate-Ready Seeds in the Neoliberal Food Regime

Anne Saab

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DECLARATION

I certify that the thesis I have presented for examination for the MPhil/PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

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ABSTRACT

This thesis explores the issue of hunger in the context of climate change. In particular, it investigates the role that international law plays in finding ways to tackle hunger. The research focuses on one particular adaptation strategy to climate change that has been proposed, namely 'climate-ready seeds'. Climate-ready seeds are genetically engineered for resistance to abiotic stresses, such as drought, and intended to increase food production in the face of climate change. This research presents narratives of climate-ready seeds that expose different perspectives on whether these seeds can contribute to solving the problem of hunger. The specific example of climate-ready seeds is seen as a reflection of the 'neoliberal' food regime. While the exploration of the role of international law focuses primarily on climate-ready seeds, the conclusions are also relevant for food regime theory more broadly.

I study the role of law in discourse on climate-ready seeds through the fields of climate change adaptation law, intellectual property law (particularly seed patents), and human rights law (especially the right to food). My main argument is that, while law is often invoked as part of the solution to climate change-induced hunger, there is little attention for the role that law plays in framing the problem. How hunger is framed as a problem determines the solutions available to solve it. Ultimately, this inquiry investigates the contribution of international law in framing hunger in the context of climate change as a problem. The analysis is based on the identification of five fundamental assumptions underlying debates on climate-ready seeds. I argue that a great deal of critical attention is directed at corporate patent rights on seeds; much less consideration is given to fundamental questions about hunger and how to eradicate it.

Finally, I apply the conclusions about the role of law in debates about climate-ready seeds to the neoliberal food regime. My broader argument is that global food relations as understood through food regime theory must consider the role that law plays in creating and reinforcing a certain way of thinking about hunger in the context of climate change. Without addressing the framework of assumptions on which the current food regime is based, it will be difficult to truly change global food relations and formulate alternative ways of combating hunger.

CONTENTS

INTRODUCTION

1 THE DOOMSDAY SCENARIO OF CLIMATE CHANGE

On 22 January 2015, scientists set the Doomsday Clock to three minutes to midnight. *The Guardian* reported that 'Climate change inaction pushes "doomsday clock" closest to midnight since 1984'.[1] The Doomsday Clock is a symbolic clock maintained by members of the Science and Security Board of the *Bulletin of Atomic Scientists*. It was initiated in 1947 to reflect the global threat of nuclear war. In 2007, climate change was added to nuclear war as one of the greatest threats to the world and mankind.[2] Lack of global action to address the problems of climate change was one of the reasons why the Doomsday Clock was moved from its 2012 time of 23:55 to the 2015 time of 23:57. The doomsday scenario brings an apocalyptic message about the devastating impacts climate change will have on all aspects of human life, if we continue to be complacent in addressing these problems. Such ominous prognoses establish an urgent context in which something must be done to save ourselves.

Aside from symbolic ticking clocks, there is very real scientific evidence that climate change is having disastrous effects on many areas of life.[3] News reports at the start of 2015 suggested that 2014 was likely the 'hottest year on record'.[4] The World Meteorological Organization noted 'exceptional heat and flooding in all parts of the world' in 2014.[5] Extreme

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[1] Abby Ohlheiser, 'The Doomsday Clock Is Ticking Again. It Is Now Three Minutes to "Midnight," A.K.A the End of Humanity' *The Washington Post*, 22 January 2015, http://www.washingtonpost.com/news/speaking-of-science/wp/2015/01/22/the-doomsday-clock-is-ticking-again-it-is-now-three-minutes-to-midnight-a-k-a-the-end-of-humanity/, last accessed on 22 July 2015; Suzanne Goldenberg, 'Climate Change Inaction Pushes "Doomsday Clock" Closest to Midnight since 1984' *The Guardian*, 22 January 2015, http://www.theguardian.com/world/2015/jan/22/climate-change-nuclear-bombs-doomsday-clock-near-midnight, last accessed on 22 July 2015.

[2] For more information about the Doomsday Clock and the Bulletin of Atomic Scientists, see The Bulletin of Atomic Scientists, 'Doomsday Clock – Timeline', http://thebulletin.org/timeline, last accessed on 22 July 2015.

[3] See, for example, the 2014 IPCC Assessment Report: Intergovernmental Panel on Climate Change, 'Summary for Policymakers' in *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. T.F. Stocker et al. (Cambridge, UK and New York, NY, USA: Cambridge University Press 2013).

[4] Suzanne Goldenberg, '2014 Officially the Hottest Year on Record' *The Guardian*, 16 January 2015, http://www.theguardian.com/environment/2015/jan/16/2014-hottest-year-on-record-scientists-noaa-nasa, last accessed on 22 July 2015; Deng Boer, '2014 Was the Hottest Year on Record' *Nature News*, 7 January 2015, http://www.nature.com/news/2014-was-the-hottest-year-on-record-1.16674, last accessed on 22 July 2015.

[5] World Meteorological Organization, '2014 on Course to Be One of Hottest, Possibly Hottest, on Record: Exceptional Heat and Flooding in Many Parts of the World' WMO Press Release No. 1009, 3 December 2014, http://www.wmo.int/pages/mediacentre/press_releases/pr_1009_en.html, last accessed on 22 July 2015.

weather events, including heat, flooding, drought, and storms, are having and will continue to have devastating effects on many people's lives, across sectors, and in many parts of the world.[6]

The Doomsday Clock was moved forward because of perceived lack of action against climate change impacts. Recognition of the serious challenges posed by climate change impacts on all sectors and regions of the world has led to increasingly urgent calls for action to be taken. This includes measures to limit further climate change, and efforts to adapt to those consequences that are already inevitable or occurring. Naomi Klein's most recently published book, *This Changes Everything: Capitalism versus the Climate*, is one of many publications that has contributed to fuelling public debates about climate change.[7] Klein's message is that while acknowledging the precarious situation in which we find ourselves, there is still hope to avoid the doomsday scenario. To prevent catastrophic climate events from proliferating and to effectively adapt to those impacts that are already occurring or inevitable, radical action must be taken.

In this research, I focus on the predicted consequences of climate change on food production, and particularly on the widespread contention that climate change contributes to exacerbating global hunger. I examine more specifically the role that international law plays in addressing the predicted exacerbated global hunger in the face of climate change. My focus in this study is not on climate science. Rather, it is on climate discourse, and in particular on how the ways to tackle negative impacts of climate change on food production are positioned within a setting of urgency – as reflected by the Doomsday Clock – and an imperative to take action against looming disaster – as articulated by authors such as Naomi Klein.

The central research question that I pose is what role international law plays in addressing hunger in the context of climate change. The main argument I make in this research is that while law is often invoked as part of the solution to climate change-induced hunger, there is too little attention for the role that law plays in framing the problem. How hunger and climate change are framed as problems determines the solutions available to solve them. If we are to find effective ways to combat hunger in the face of climate change, then there must be more awareness of how the problems are framed, and more particularly: how international law and legal discourse contribute to this framing. I address the research question and come to my conclusions about the role of law through the example of one proposed adaptation strategy, namely so-called 'climate-ready seeds'. This introduction will set out the links between climate

[6] The impacts of climate change will affect different sectors, regions, and peoples differently. It is widely recognized that the developing world and the poorest people will suffer disproportionately, as they are already vulnerable and have less capacity to adapt.

[7] Naomi Klein, *This Changes Everything: Capitalism versus the Climate* (London: Allen Lane, 2014).

change and hunger, introduce climate-ready seeds as a proposed means to increase food production, and suggest that law is relevant in addressing hunger and climate change.

2 CLIMATE CHANGE, FOOD, AND HUNGER

The fifth and latest report by the Intergovernmental Panel on Climate Change (IPCC) of 2014 indicates that it is highly likely that the impacts of climate change – including higher average temperatures, more (severe) instances of drought, and higher levels of precipitation – will adversely affect food production.[8] While there are some regions where food production may benefit from a rise in temperatures, on the whole the effects of climate change on food production are negative. The 2014 Climate Summit held in September at the UN Headquarters in New York gave particular attention to agriculture. Agriculture was one of the 'action areas' during this summit, and experts emphasized that 'the warming of the planet is already affecting yields of crucial crops'.[9]

Following the Climate Summit and the publication of the fifth IPCC assessment report, there was a surge of attention in some media avenues for climate change in general and food in particular. An article in *The Guardian* suggested that climate change experts are 'reframing climate change as a food issue' in attempts to 'mobilise people' and to 'break the political deadlock on global warming'.[10] Unlike complex and uncertain calculations about climate change, food is something that people can understand and relate to. The article cites parts of an interview by Rachel Kyte, the World Bank's vice president on climate change, given just before the IPCC report was released. Kyte refers to food as a 'universal concern': it is important to people 'whether you are rich or poor'.[11] The connection between climate change and food is a very obvious one, considering the intricate relationship between climate and food production. Food production is dependent on climatic conditions, and variations in these conditions lead to changes in food production.

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[8] John R. Porter et al., 'Food Security and Food Production Systems', Chapter 7 in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, UK and New York, NY, USA: Cambridge University Press, 2013).

[9] UN Climate Summit 2014, 'Action Area: Agriculture', http://www.un.org/climatechange/summit/wp-content/uploads/sites/2/2014/07/Climate-Summit-Action-Areas_Agriculture1.pdf, last accessed on 22 July 2015.

[10] Suzanne Goldenberg, 'Frame Climate Change as a Food Issue, Experts Say' *The Guardian*, 1 April 2014, http://www.theguardian.com/environment/2014/apr/01/climate-change-food-issue-ipcc-report, last accessed on 22 July 2015.

[11] Ibid.

My interest in this research is not food in general, but the problem of hunger specifically. As a result of the predicted impacts of climate change on agriculture, crop yields, and food production, climate change has also come to be connected to hunger. I am interested not so much in the actual decline in food crop yields that climate change is predicted to cause, but rather in the prognosis that this decline will exacerbate global hunger.

Hunger has been a persistent phenomenon throughout human history. It is in no way a new problem unique to our times. There have been efforts to eradicate or at least alleviate global hunger. The Food and Agriculture Organization (FAO) in a 2015 report 'The State of Food Insecurity in the World'[12] presents figures that show that malnourishment has declined globally, from over 1 billion persons and 18.6% of world population in 1990-1992 to just over 800 million persons and 11.8% of the world population in 2010-2012.[13] 800 million hungry people in the world is still a huge number. Moreover, on the African continent, while the percentage of malnourished persons has declined, the actual number has increased.[14] Despite a decline in the total number and percentage of hungry people in the world, too many people in the world still suffer from hunger and are vulnerable to food insecurity.

The realization that climate change is already having and will continue to have severe consequences for food production has brought renewed attention to the problem of hunger. The World Food Programme states that:

> Climate change is making climate disasters, such as floods and droughts, more frequent and intense, land and water more scarce and difficult to access, and increases in agricultural productivity even harder to achieve. *These impacts are increasing the risk of hunger and the breakdown of food systems.*[15]

Other reports echo this view, maintaining that climate change will 'worsen hunger', and even that it may become a 'leading cause of hunger'.[16] The storyline here is that climate change is already

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[12] Food and Agriculture Organization, International Fund for Agricultural Development and World Food Programme, 'The State of Food Insecurity in the World 2015. Meeting the 2015 International Hunger Targets: Taking Stock of Uneven Progress' (Rome: FAO, 2015).
[13] Ibid., 'Table 1: Undernourishment around the world, 1990–92 to 2014–16', on page 8.
[14] Ibid. In 1990-1992, 181.7 million persons constituting 27.6% of the population in Africa; in the 2014-2016 projection 232.5 million persons constituting 20% of the population.
[15] World Food Programme, 'How Climate Change Affects Hunger', https://www.wfp.org/climate-change, last accessed on 22 July 2015. Emphasis added.
[16] Action Against Hunger, 'Climate Change Could Become a Leading Cause of Hunger', http://www.actionagainsthunger.org/blog/climate-change-could-become-leading-cause-hunger, last accessed on 22 July 2015; Ben Block, 'Climate Change Will Worsen Hunger, Study Says', World Watch Institute,

adversely affecting agriculture and food production, and will continue to do so. As a consequence, the availability of food, especially in the most vulnerable regions of the world, will not keep up with the demand. Lack of sufficient food supplies will then lead to exacerbated hunger. The apocalyptic doomsday scenario sketched in relation to climate change inaction in general, and the increased linking of climate change and exacerbated hunger in particular, influence the strategies devised to address this issue.

3 RACE AGAINST THE CLOCK TO INCREASE FOOD PRODUCTION

When it has been acknowledged that climate change is one of the greatest threats to mankind today, and that agriculture, food production, and hunger are key areas of concern, what strategies are devised to deal with these problems? How do we ensure that people do not go hungry as a result of failing crop yields? Much of the discourse on climate change and hunger emphasizes the need to increase food production. Failing crop yields, or declines in production and availability of food, are presented as the main threats in terms of global hunger. Therefore, it makes sense to focus attention on increasing food production as a solution.

The UN Climate Summit that took place in New York in September 2014 underscored the need to increase food production in the face of climate change. On the website of this summit, the following statement can be found:

> Food production will need to increase by at least 60 per cent over the next 35 years to provide food security for the 9 billion people expected to be living on the planet by 2050. The changing climate directly impacts food security and the supply of nutritious, ample and safe sources of reasonably priced food for the planet's 7 billion people as well as their growing demands. The warming of the planet is already affecting yields of crucial crops.[17]

A 60 per cent increase in food production in 35 years is considerable. How will we achieve this increase in production?

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http://www.worldwatch.org/node/6271, last accessed on 22 July 2015; Martin Parry et al., 'Climate Change and Hunger: Responding to the Challenge' (World Food Programme, 2009).

[17] UN Climate Summit 2014, note 9 above.

Agricultural biotechnologies, and particularly genetic engineering techniques, have been presented in recent years as valuable tools for increasing food production. Genetically modified (or GM) crops are often presented as 'a food security solution'.[18] Interest in genetic engineering techniques predates widespread recognition of the urgency of climate change. In 1970, Norman Borlaug, a plant breeder, received the Nobel Peace Prize for his work on developing high-yielding varieties of wheat. As Jack Kloppenburg notes, '[i]t was this ostensible contribution to the eradication of hunger, and by extension to world peace, that earned Borlaug his status of Nobel laureate'.[19] Agricultural biotechnologies have therefore been linked to increasing food production and to eradicating hunger.

Louise Fresco has posed the question: 'Will GMOs increase the amount of food in the world, and make more food accessible to the hungry?'[20] Both of these elements are crucial and very relevant to my research. The first relates to whether genetic engineering techniques can successfully increase crop yields; the second relates to whether the potential extra food produced will be accessible to those who need it most. There is a vast amount of debate about the effectiveness (in terms of crop yields) and the desirability (in terms of how the benefits are distributed) of genetically engineered seeds and crops. I will not focus on these debates in this research, but it is nevertheless important to acknowledge that climate-ready seeds are situated in this context of controversy over GM seeds and crops.

4 CLIMATE-READY SEEDS IN THE NEOLIBERAL FOOD REGIME

In this research, I draw on discourse surrounding one proposed adaptation strategy to the negative impacts of climate change on agriculture, namely 'climate-ready seeds'. Climate-ready seeds are genetically engineered for resistance to climate change-related stresses (such as drought and increased soil salinity) so as to achieve higher levels of food production. Opinions about the desirability and necessity of these seeds are highly varied. While some advertise climate-ready seeds as necessary to increase food production and tackle hunger in the face of climate change, others are critical of the presumed monopoly of a handful of large private seed corporations in

[18] Jacqui Dibden, David Gibbs, and Chris Cocklin, 'Framing GM Crops as a Food Security Solution' *Journal of Rural Studies* 29 (2013).
[19] Jack Ralph Kloppenburg and American Association for the Advancement of Science, *Seeds and Sovereignty: The Use and Control of Plant Genetic Resources* (Durham, N.C.; London: Duke University Press, 1988), 1.
[20] Louise O. Fresco, 'Genetically Modified Organisms in Food and Agriculture: Where Are We? Where Are We Going?' a paper presented at the conference *Crops and Forest Biotechnology for the Future* (Royal Swedish Academy of Agriculture and Forestry, Falkenberg, Sweden, 2001).

the research and development of these seeds. In this research, contradictory accounts of climate-ready seeds are used as a means through which to explore the role that international law plays in finding ways to address climate change-induced hunger.

In order to put the discourse on climate-ready seeds within a broader context, I rely on food regime theory. This theory is an analytical tool to explore and explain global food relations. More specifically, I highlight the current/emerging 'neoliberal' food regime and show that the contradictory perspectives on climate-ready seeds exemplify some of the key tensions that exist within this food regime. These tensions are between increasingly corporatized and privatized food relations, on the one hand, and counter movements that promote more sustainable, small-scale, and local farming, on the other hand. Authors such as Naomi Klein have called for radical action against the impacts of climate change, which requires an overhaul of our current economic model based on neoliberal, free market capitalism. Such an overhaul would affect also global food relations, and particularly the way in which hunger in the context of climate change is dealt with.

In this research, I view contradictory accounts of climate-ready seeds as reflections of the tensions within the neoliberal food regime, and I draw broader conclusions about the role of law in food regime analysis. Examining contentious stories about climate-ready seeds within the broader framework of the neoliberal food regime, I argue that international law contributes to foregrounding certain assumptions about hunger in the context of climate change and how to deal with it. The urgency with which the impacts of climate change are presented creates a conducive setting in which to reinforce these assumptions. Ultimately, the way in which international law is framed and invoked is resistant to radical systemic changes to our global food system.

5 THE ROLE OF LAW IN PREVENTING CLIMATE CHANGE DISASTER

In February 2013, I attended an event at the office of DLA Piper in London, entitled 'Can the Law Save the Environment?'[21] The event was organized by the Coalition for an International Court for the Environment.[22] The primary purpose of the event, as I understood it, was to

[21] Stakeholder Forum for a Sustainable Future, 'Feb 7 Event: Can the Law Save the Environment', http://www.stakeholderforum.org/sf/index.php/news/505-feb-7-event-can-the-law-save-the-environment, last accessed on 22 July 2015.
[22] 'ICE Coalition: Creating the International Court for the Environment', http://icecoalition.com/, last accessed on 22 July 2015.

discuss ways in which international law could be framed to hold actors accountable for causing harm to the environment. The scope of these discussions was rather broad. The representation of law as a kind of 'saviour' got my attention. The Australian Centre for Climate and Environmental Law at the University of Sydney had organized a conference in 2010, and framed the role of law in similar wording. The conference was entitled 'Resilience and Climate Change Conference: Law's Responses'. Referring to this conference, the University of Sydney website contained a headline which read: 'How the law can help save the environment'.[23]

These events and headlines suggest a belief that law can play a role in saving the environment, and by inference saving *us* from the consequences of environmental disasters, including climate change. Law can contribute to regulating behaviour that is detrimental to the environment, for instance carbon emissions. Such regulation could for example be achieved by holding states and other entities accountable for causing pollution and damaging the environment, and thereby seek to discourage this behaviour. Law can also be used as a tool to encourage actions that will improve the environment and achieve effective adaptation to the impacts of climate change. This could take the form of, for instance, legislation that allows and encourages the development and use of new biotechnologies for agriculture. The portrayal of law as a saviour is an important part of the context of my research. I argue that, before categorizing law as part of the solution, we must consider what role law plays in framing the problem and setting the contours within which solutions are found.

The relevance of law in addressing problems related to climate change is reiterated by legal and policy experts. For instance, Mary Robinson, former President of Ireland and former UN High Commissioner for Human Rights, has stated that the impacts of climate change are 'as much social as physical, and the solutions as much legal as technical'.[24] She articulates that climate change is 'a rights issue and a legal issue', and that our approach to finding a legal and just solution needs to be informed by 'all relevant aspects of law at national, regional and international level'.[25] Accordingly, the impacts of climate change – including on hunger – are also legal problems, and law plays a role in finding solutions to them. In this thesis, I explore different areas of international law that are relevant in discourse on climate-ready seeds, specifically: climate change adaptation law, intellectual property law, and human rights law.

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[23] The University of Sydney, 'How the Law Can Help Save the Environment', http://sydney.edu.au/news/84.html?newsstoryid=5486, last accessed on 22 July 2015.
[24] Mary Robinson, 'Social and Legal Aspects of Climate Change' *Journal of Human Rights and the Environment* 5, Special Issue (2014), 15.
[25] Ibid., 16.

6 INTERNATIONAL LAW

The question that leads my exploration is: What role does law play in finding ways to address the problem of hunger in the context of climate change? It is important to explain at the outset what it is that I understand by 'law'. In the previous section, I cited Mary Robinson referring to law at 'national, regional and international level'. Different levels of law are relevant in addressing climate change and hunger. Here, my emphasis is on international law. I study climate change and hunger as global problems. I explore a number of areas of international law as they are relevant for climate-ready seeds. The premise of my research is that international law has a role to play in addressing climate change and hunger; however, I do not assume that that role is necessarily positive. While some references in the previous section presented law as a saviour, I also rely on authors who paint a more critical picture. In a recent publication about social and legal aspects of climate change, Anna Grear and Conor Gearty emphasize that law may be 'counter-productive' in its response to climate change.[26] The authors highlight 'the complicity of law and society in its production as well as the paradoxes and promises of the role of law and society in seeking solutions' to climate change.[27] In this research, I uncover the complicity of law in sustaining 'neoliberal' solutions to climate-induced hunger. I will argue that there are structural tendencies in law – both in the way that law is framed and in the way it is employed by different actors – that limit the possibilities to address complex problems relating to climate change.

I study law not simply as a set of legal texts that regulate climate change action and hunger policy. Rather, I view law as an intellectual framework, including instruments (legal texts), the ways in which these instruments are used by different actors, and interpretations thereof. In this sense, law also includes institutions formulating and invoking instruments and interpretations. I understand law as a body of practice and a body of thought. Law is what is written in treaties, and law is also legal discourse. Understanding the structural tendencies of law requires me to understand law in a broad manner, as a system of processes, rather than simply a body of texts. Therefore, when I use the word 'law' in this thesis, I am referring to international law in this broad understanding, including legal texts, legal discourse, and legal processes.

International law operates within a much bigger system of processes, including social, economic, and political ones. What is significant about law that makes it worthwhile exploring its role as separate from these other considerations? International law both reflects and influences

[26] Anna Grear and Conor Gearty, 'Editorial: Choosing a Future: The Social and Legal Aspects of Climate Change' *Journal of Human Rights and the Environment* 5, Special Issue (2014), 6.
[27] Ibid., 7.

social, economic, and political ideas and possibilities. Climate change and its predicted impacts are viewed as enormous threats. This is a formidable backdrop against which law can be presented as a solution. At the same time, framing law as a solution reinforces certain presumptions about the problems. On the one hand, law provides part of the toolbox to solve social, economic, and political problems related to climate change impacts. On the other hand, law also contributes to creating and maintaining the framework within which these problems are defined and understood. My research hypothesis is that there is a lot of emphasis on law as a part of the solution, as formulating answers, but too little attention for the tendencies in law that contribute to determining the range of possible answers. I examine the role of international law in accounts of climate-ready seeds, and I extend my conclusions also to the relevance of law for debates about the neoliberal food regime.

7 THESIS OUTLINE

The central issue that forms the starting point of this research project is that there are hefty contradictions in perspectives on how to deal with the predicted exacerbation of hunger and food insecurity in the face of climate change. The thesis question focuses on the role that law plays in resolving these contradictions. I study one proposed means to adapt to decreasing crop yields, and explore the role of law in conflicting accounts of climate-ready seeds. My main conclusion is that international law – in the way that it is formulated and invoked by different actors – contributes to framing the problems of hunger and climate change. This framing has a hand in determining the possible solutions. I will outline here the successive chapters of the thesis, and explain how the discussions in the chapters lead to the main analysis and conclusions.

In Chapter 1, I start by identifying and explaining the main themes and issues of the research. This chapter sets out the concepts of food (in)security and hunger; presents two dominant perceptions of hunger in terms of availability and access; and introduces hunger as a human rights issue, or a legal problem. Chapter 1 also introduces food regime theory. The history and contours of food regime theory are traced, before focusing on the current/emerging 'neoliberal' food regime. Some of the key features of the neoliberal food regime are privatization and corporatization of the global food system, in line with features of neoliberal capitalism more generally. Food sovereignty movements are presented as a response to tensions within the neoliberal food regime. In the last part of Chapter 1, I elaborate on the predicted impacts of climate change on agriculture, food production, and hunger. In this light, climate-ready seeds are

proposed as a possible adaptation strategy. The last part of the chapter delineates different narratives of climate-ready seeds, based on the question of whether these seeds can contribute to combating hunger in the context of climate change. Contradictory narratives of climate-ready seeds – with seed corporations promoting these seeds, on the one hand, and civil society organizations rejecting them, on the other hand – reflect larger tensions within the neoliberal food regime. Chapter 1 lays the groundwork for explorations in the following chapters, which examine how different areas of international law are relevant for, and employed in, narratives of climate-ready seeds. In Chapter 5, I extend my research conclusions to argue the relevance of international law for food regime analysis.

Chapters 2, 3, and 4 each address an area of international law that is relevant to narratives of climate-ready seeds. In identifying contentious accounts of climate-ready seeds, it appears that intellectual property law (particularly patent rights) and human rights law (particularly the right to food) are most relevant. Seed corporations use intellectual property law to gain patent rights on new seeds and technologies; while civil society organizations seek to counter corporate monopoly through (human) rights discourse. Intellectual property law and human rights law are discussed in Chapter 3 and Chapter 4, respectively.

I start in Chapter 2 with climate change adaptation law. Different voices in discourse on climate-ready seeds do not manifestly employ adaptation law. Nevertheless, I believe that it is important to examine what adaptation law suggests about climate-ready seeds as a possible adaptation strategy. I specifically discuss what adaptation law conveys about the use of biotechnologies and the involvement of the private sector; both these points are relevant for climate-ready seeds. The key argument is that international climate change adaptation law creates an enabling environment for the use of genetically engineered seeds, and moreover extends an invitation to the private sector to be engaged in developing adaptation strategies.

In Chapter 3, I discuss intellectual property law and particularly explore how law is invoked in controversial debates about rising patent rights on climate-ready seeds. This chapter illustrates that seed corporations benefit from the international intellectual property law that allows plant genetic resources to be patented; this exemplifies 'neoliberal' features of the current food regime. Critics strongly oppose the presumed monopoly of corporations through seed patents, and invoke alternative proprietary rights, notably sovereign rights over natural resources and farmers' rights, as a means of resistance; this is in line with food sovereignty movements. The discussion in this chapter illustrates that the biggest contention is about the monopoly of seed corporations through patent rights on climate-ready seeds. More fundamental questions

about whether seeds should be subject to intellectual property rights and whether intellectual property protection incentivizes innovation that benefits society, are left in the background.

Chapter 4 discusses human rights law, and especially the relevance of the right to food in narratives of climate-ready seeds. Climate change has come to be considered as a threat to human rights, and human rights-based approaches are utilized as means to direct adaptation strategies towards the realization of human rights. In addition to the concepts of sovereign rights and farmers' rights, the right to food is often invoked in efforts to focus attention on individuals suffering from hunger in the face of climate change. Right to food discourse is utilized as a means to oppose corporate domination of climate-ready seeds, and is also often related to food sovereignty movements. While critics employ human rights most explicitly, this chapter illustrates that seed corporations also benefit from human rights discourse.

Chapter 5 contains the main analysis of my thesis. Based on the examinations in Chapters 2, 3, and 4, I argue that while there are serious contradictions in perspectives of how to address hunger in the face of climate change, certain fundamental underlying assumptions are left in place. I view these assumptions as a pyramid. As previously stated, the most explicit controversy in discussions about climate-ready seeds focuses on corporate patent rights. This controversy constitutes the tip of the pyramid. I argue that placing so much emphasis on this issue serves to leave other questions in the background. Each assumption higher in the pyramid presumes the acceptance of assumptions lower in the pyramid. I identify five assumptions, the first forms the base of the pyramid, and each following assumption is one step higher in the pyramid: 1) climate change causes hunger; 2) increased food production is necessary to eradicate hunger; 3) agricultural biotechnologies are necessary to increase food production; 4) private sector investments in agricultural biotechnologies are necessary to eradicate hunger; and 5) intellectual property rights on seeds are necessary to incentivize investments in agricultural biotechnologies that will eradicate hunger.

I draw on the materials and discussions in the foregoing chapters to argue that the way in which international law is framed and how it is invoked has a hand in leaving these assumptions in place. Climate change adaptation law sets the stage particularly for the first four assumptions, by emphasizing that climate change impacts adversely on crop yields and presenting agricultural biotechnologies and private sector engagement as factors in adaptation strategies. Intellectual property law allows for the application of patent rights on seeds, and is relevant most obviously to the fifth assumption. Concepts of sovereign rights over natural resources and farmers' rights propose to claim recognition and reward for developing countries and farmers, but do not primarily intend to reject the idea that intellectual property rights can incentivize innovations.

Human rights discourse reinforces the urgency of climate change impacts, emphasizing the link between climate change and hunger. Moreover, private sector engagement is increasingly recognized in human rights law. The right to food is used most clearly in efforts to direct adaptation strategies towards realizing the right to food, and not to challenge these assumptions.

This main analysis of my thesis is based on the cumulative role of international law, and identifies tendencies that cannot be observed by looking only at distinct fields of law, separately. The pyramid of assumptions links back to the premise set out in Chapter 1, which suggests that the way in which the problem of hunger is framed determines its solutions.

The pyramid of assumptions is also connected back to the neoliberal food regime. Contentions in discourse about climate-ready seeds exemplify some of the key tensions within the current food regime. These tensions, among others, have led theorists to predict the possible emergence of a new food regime that will go beyond global food relations based on corporatization and privatization, and towards more sustainable, ecologically-informed agricultural practices. Extending my conclusions to food regime theory, then, I argue that legal analysis is relevant in examining and understanding food regimes. The tendencies in international law forego direct challenges to fundamental assumptions, and are thereby resistant to real changes in global food relations characterized by 'neoliberalism'. I believe that changes to the neoliberal food regime are necessary and desirable to effectively address global hunger in the context of climate change, and therefore I argue that the resistance of law should be recognized and dealt with.

The Conclusion summarizes the course and outcomes of this research project. I end my conclusion with a brief reference to Naomi Klein's work on climate change and capitalism,[28] to suggest that law, as it is employed by those who oppose modes of neoliberal capitalism, may also unintentionally have a hand in framing contexts in which neoliberal capitalism can flourish.

8 CONTRIBUTION TO KNOWLEDGE

In this research, I make a number of contributions to existing literature and knowledge. I draw on food regime theory and present contradictory narratives of climate-ready seeds as reflections of the tensions within the current, 'neoliberal' regime. Through examining and analysing the role that international law plays in accounts of climate-ready seeds, I also apply a legal dimension to

[28] Klein 2014, note 7 above. I will also draw lightly on Klein's earlier work on 'disaster capitalism': Naomi Klein, *The Shock Doctrine: The Rise of Disaster Capitalism* (London: Allen Lane, 2007)

food regime analysis. Food regime analyses have been concentrated in the social sciences, mainly sociology and geography, and have not incorporated legal analysis. Likewise, legal scholars have not engaged with food regime theory. I argue in this research that law is relevant in shaping global food relations, and that applying a legal perspective to food regime analysis can contribute to better understanding, analysing, predicting, and defining future regimes. I argue that, if we wish to move beyond the neoliberal food regime towards a more sustainable, ecologically-informed regime, international law must be taken into account.

I also contribute to existing scholarship in the way that I study international law. While there is plenty of academic interest and work in the different areas of international law that I examine – climate change law, intellectual property law, and human rights law – I draw conclusions about the cumulative role of law. I look at the overall effect of how these areas of law are invoked in narratives of climate-ready seeds. My argument in this regard is that international law, understood broadly and comprehensively, has a hand in framing situations and problems, and therefore also contributes to determining the range of possible solutions. The following chapters will demonstrate these arguments and contributions.

1. CLIMATE-READY SEEDS IN THE NEOLIBERAL FOOD REGIME

INTRODUCTION

This first chapter will set out the contours of the research. It will begin by providing definitions for the terms hunger and food (in)security, presenting two prevalent perceptions of hunger in terms of production of food and access to food, and linking hunger to international law. The second part of this chapter will introduce food regimes as a theoretical framework through which to understand hunger, with an emphasis on the current, neoliberal food regime. Finally, the third part of this chapter will introduce climate-ready seeds and set out different narratives that address whether these seeds can contribute to alleviating hunger. Contradictory narratives of climate-ready seeds will be presented as reflections of the tensions within the neoliberal food regime, and will form the basis for the exploration in this thesis.

1 HUNGER AND FOOD SECURITY

Frances Moore Lappé and Joseph Collins have noted that '[h]ow we understand hunger determines what we think are its solutions'.[1] To study the role of international law in attempting to solve hunger in the context of climate change, a first necessary step is to understand how hunger is defined and understood. Posing the question of how law contributes to 'solving' hunger suggests that there is a problem to be solved. What exactly is the 'problem' of hunger? The terms 'hunger' and 'food security' are used frequently in discourse relating to the impacts of climate change on agriculture. This first part of the chapter will set out definitions of hunger and food security in the first section. The second section will elaborate on two prevalent perspectives on hunger, in terms of availability of food and access to food. The third section will explain that hunger has come to be viewed as a legal issue, particularly in terms of human rights.

[1] Frances Moore Lappé and Joseph Collins, *World Hunger: Twelve Myths*, 2nd ed. (London: Earthscan, 1998), 4.

1.1 FOOD (IN)SECURITY AND HUNGER

The 1974 World Food Conference described 'food security' as 'availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices'.[2] The 1996 World Food Summit defined food security as existing 'when 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'.[3] The Food and Agriculture Organization (FAO) has deduced four dimensions of food security from this latter definition, namely 'physical *availability* of food', 'economic and physical *access* to food', 'food *utilization*', and '*stability* of the other three dimensions over time'.[4]

Food *in*security involves a circumstance where these dimensions are not met. The 2015 'State of Food Insecurity in the World' refers in its subtitle to 'hunger'.[5] Quests to realize food security appear to be closely connected to pursuits to eradicate hunger. The Rome Declaration on World Food Security, presented at the World Food Summit of 1996, highlights 'eradicating hunger' as a primary objective.[6] What, then, is the definition of hunger, and how does it relate to food security?

The FAO has stated that:

> Hunger is usually understood as an uncomfortable or painful sensation caused by insufficient food energy consumption. Scientifically, hunger is referred to as food deprivation. Simply put, all hungry people are food insecure, but not all food insecure people are hungry, as there are other causes of food insecurity, including those due to poor intake of micro-nutrients.[7]

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[2] United Nations, 'Report of the World Food Conference, Rome 5-16 November 1974' (New York, 1975). See also: Food and Agriculture Organization of the United Nations (FAO), 'Food Security: Concepts and Measurements', http://www.fao.org/docrep/005/y4671e/y4671e06.htm, last accessed on 22 July 2015.

[3] FAO, 'Rome Declaration on World Food Security and World Food Summit Plan of Action, World Food Summit 13-17 November 1996' (Rome, 1996), http://www.fao.org/docrep/003/w3613e/w3613e00.HTM, last accessed on 22 July 2015. Emphasis added.

[4] FAO, 'An Introduction to the Basic Concepts of Food Security', EC - FAO Food Security Programme 2008, www.foodsec.org/docs/concepts_guide.pdf, 3, last accessed on 22 July 2015.

[5] Food and Agriculture Organization, International Fund for Agricultural Development and World Food Programme, 'The State of Food Insecurity in the World 2015. Meeting the 2015 International Hunger Targets: Taking Stock of Uneven Progress' (Rome: FAO, 2015). See also: Introduction at note 12.

[6] FAO 1996, note 3 above, at second paragraph of introduction, and paragraphs 7 and 13 of the commitments.

[7] FAO 2008, note 4 above.

Hunger can therefore be understood as primarily a problem of people not consuming adequate food. Hunger can be understood as a personal experience, and it can also be perceived as a local, regional or global problem. Is this sense, hunger can be viewed as 'the want or scarcity of food in a country',[8] or in a certain region. In this research, hunger is understood as a global problem, as a problem that affects individuals but must be addressed on a global level.

Further distinctions can be made within the concept of hunger. The term 'famine' implies specific instances of hunger in which more people than usual starve to death in a certain area. The World Food Programme identifies three conditions that, according to experts, must be present for a famine to be declared, being:

1) At least 20 percent of households face extreme food shortages with limited ability to cope;
2) The prevalence of global acute malnutrition[9] exceeds 30 percent;
3) Death rates exceed 2 deaths per 10,000 people per day.[10]

The term 'malnutrition' signifies the state in which a person's bodily capacities (such as growth, pregnancy, learning abilities, etc.) are impaired as a result of not receiving the required nutrition.[11] The most extreme form of malnutrition, in the case of a deficiency in calorie intake, is referred to as starvation. Starvation can lead to the complete shutting down of bodily functions, and eventually leads to death.

Hunger and its related terms centre on the person(s) or group(s) of people suffering from the consequences of the lack of adequate food supply available or accessible to them. The term food security is broader, encompassing also dimensions beyond availability and access, namely utilization of food and the stability of these conditions over time. Food security and hunger are interconnected, and are often used interchangeably.[12] This research focuses more on hunger, and the emphasis is therefore on the (predicted) effects of lack of availability and access to adequate food on people. Food (in)security will also be employed, but only in the

[8] Worldhunger.org, '2013 World Hunger and Poverty Facts and Statistics', http://www.worldhunger.org/articles/Learn/world%20hunger%20facts%202002.htm, last accessed on 22 July 2015.
[9] Acute malnutrition is evidence by very low weight as compared to height, and wasting. See: World Health Organization, 'Severe Acute Malnutrition', http://www.who.int/nutrition/topics/malnutrition/en/, last accessed on 22 July 2015.
[10] World Food Programme, 'Hunger FAQS', http://www.wfp.org/hunger/faqs, last accessed on 22 July 2015.
[11] World Food Programme, 'Hunger Glossary', http://www.wfp.org/hunger/glossary, last accessed on 22 July 2015.
[12] As can be seen in the above references, and as will also become more evident when discussing hunger in the face of climate change in later chapters of this research.

understanding that this term encompasses a broader context in which availability and access to food are at risk, and that this research does not deal with the entire complexity that constitutes food security.

Both the availability of food and access to food are necessary conditions to eradicate hunger and to realize food security. However, different presentations of hunger place more emphasis on either lack of availability of food or lack of access to food as the primary cause of hunger. The next section will identify two perceptions of hunger that illustrate these different accentuations.

1.2 PERCEPTIONS OF HUNGER: AVAILABILITY AND ACCESS

'History', as historian James Vernon tells us, 'cannot escape hunger'.[13] Hunger is not a new phenomenon. Vernon notes at the beginning of his book that 'hunger's perpetual presence and apparently unchanging physical characteristics belie the way in which its meaning, and our attitudes towards the hungry, change over time'.[14] This section will identify and discuss two perceptions of hunger that have been dominant in modern history. The first is a perception of hunger as primarily a problem of food availability, and will be explained through the ideas of Thomas Malthus as presented in his work on the principles of population first published in the late 18th century.[15] The second is a perception of hunger as being primarily a problem of access to food, and will be explained through Amartya Sen's work on poverty and famines written and published in the 1980s.[16] While we must acknowledge that Malthus and Sen wrote in different times, and that the complexity of their work went beyond simply 'availability' versus 'access', both of their central ideas are still popular and relevant in contemporary discussions about hunger.

Thomas Malthus, an 18th century British cleric and scholar, was centrally concerned not with hunger, but rather with the issue of population growth and its limitations in the face of limited subsistence resources. His thinking has nevertheless been, and continues to be, very

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[13] James Vernon, *Hunger: A Modern History* (Cambridge, MA: The Belknap Press of Harvard University Press, 2007), 1.

[14] Ibid., 2. See also on the history of hunger: Sarah Millman and Robert W. Kates, 'Toward Understanding Hunger' in *Hunger in History: Food Shortage, Poverty and Deprivation*, ed. Lucile F. Newman and William Crossgrove (Oxford: Basil Blackwell, 1989), 3: 'We learn from our perusal of history that the causes of hunger are multiple, the conditions of hunger are several, the consequences of hunger are varied, and the effort to prevent or alleviate hunger constitutes a major, continuing strand of human history.'

[15] Thomas Robert Malthus, 'An Essay on the Principle of Population' (1798, 1st edition) in *The Online Library of Liberty*, http://oll.libertyfund.org/title/311, last accessed on 22 July 2015.

[16] Amartya Kumar Sen, *Poverty and Famines: An Essay on Entitlement and Deprivation* (Oxford, New York: Clarendon Press; Oxford University Press, 1981).

pertinent to understanding hunger. Malthusian theory, which was and remains controversial, is grounded on the belief that hunger is a natural consequence of a growing population in combination with inadequate food supplies to feed them. According to Malthus, two postulates determine the incidence of hunger: one is that food is necessary for survival; the second is that people will continue to reproduce.[17] Malthus's contention was that a population, when unchecked, grows in a geometrical ratio, whereas food for human subsistence grows in an arithmetic ratio.[18] In his famous work, 'An Essay on the Principles of Population', he writes that there are positive checks, which increase the death rate, and negative checks, which decrease the growth rate, to curb population growth so as to stay within the limits of subsistence.[19] Hunger is one example of a positive check, meaning that people dying of hunger is a natural response to a population growing faster than subsistence levels. An example of a negative check is actively controlling population growth to prevent widespread hunger. Malthusian theory tends to be understood as placing the fault for hunger on the hungry, with the idea that if you do not wish to be hungry, you should stop reproducing and expanding the human population beyond what the available food supplies can support.[20]

Malthusian perception of hunger as an inevitable consequence of population growth continues to be dominant in many contemporary perceptions of hunger, albeit in different terms.[21] Peter Oosterveer and David Sonnenfeld referred to Malthus as 'the first environmentalist because he argued that the natural limits to producing food would force

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[17] Malthus, note 15 above, Chapter I: 'I think I may fairly make two postulata.

- First, That food is necessary to the existence of man.
- Secondly, That the passion between the sexes is necessary and will remain nearly in its present state.

These two laws, ever since we have had any knowledge of mankind, appear to have been fixed laws of our nature; and, as we have not hitherto seen any alteration in them, we have no right to conclude that they will ever cease to be what they now are, without an immediate act of power in that Being who first arranged the system of the universe; and for the advantage of his creatures, still executes, according to fixed laws, all its various operations.'

[18] Ibid., Chapter I: 'Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio. A slight acquaintance with numbers will shew the immensity of the first power in comparison of the second.'

[19] Ibid., Chapter III: '… misery is the check that represses the superior power of population, and keeps its effects equal to the means of subsistence.' Malthus also refers to 'preventive checks', including restraints on marrying, see Chapter IV. At Chapter V on positive checks: 'The positive check to population, by which I mean, the check that represses an increase which is already begun, is confined chiefly, though not perhaps solely, to the lowest orders of society.'

[20] John R. Butterly and Jack Shepherd, *Hunger: The Biology and Politics of Starvation* (Hanover, N.H.: Dartmouth College Press: Published by University Press of New England, 2010), 12.

[21] For example, the UK think tank Population Matters argues for limiting the global population in the light of diminishing resources as a way to tackle poverty and hunger. Population Matters, http://www.populationmatters.org/, last accessed on 22 July 2015. In media references, limiting population has also been linked directly to climate change, for example: Rebecca Smith, 'Limit Families to Two Children "To Combat Climate Change"' *The Telegraph*, 24 July 2008, http://www.telegraph.co.uk/news/2454215/Limit-families-to-two-children-to-combat-climate-change.html, last accessed on 22 July 2015; Stephen Emmott, 'Humans: The Real Threat to Life on Earth' *The Guardian*, 13 June 2013, http://www.theguardian.com/environment/2013/jun/30/stephen-emmott-ten-billion.

humanity to adapt their behavior'.[22] Although Malthus's ideas about forcibly limiting population growth and placing the blame for hunger on the hungry population itself have been vastly criticized,[23] the belief that population growth in combination with insufficient increases in food production is the foremost cause of hunger is still alive today.

Since Malthus's time, the world population has grown many times over, and many studies show that there is currently enough food available to feed more than the world population. A 2010 report by Oxfam Canada has stated that the world 'produces 17% more food per person today than 30 years ago'.[24] The Food and Agriculture Organization and the World Food Programme also point out that there is enough food available globally to feed the world.[25] Hunger is therefore not caused solely by population growth in combination with insufficient resources, but also by the fact that some people do not have access to adequate food. Whereas Malthusian conceptions of hunger emphasize availability of food, Sen stresses access to food.

Indian economist and philosopher Amartya Sen has been influential with his work on economic theories on famines. Sen dismisses the contention that hunger is the direct result of not enough food being available, and has famously written that 'starvation is the characteristic of some people not having enough to eat. It is not the characteristic of there being not enough food to eat.'[26] Regarding hunger as resulting primarily from the deprivation of the hungry, rather than the physical lack of food, necessarily alters approaches to alleviating hunger. Vernon notes that hunger 'was firmly established as a humanitarian cause celèbre' in the last decades of the 19th century.[27] The Ethiopian famine was a landmark in the perception of modern hunger. Culminating in over 300,000 deaths by starvation by 1973, and with the knowledge that there was enough food available globally, this famine signalled that *access* to food must be improved.[28] Hunger is neither merely a 'natural' nor an 'inevitable' phenomenon: human actions and systems contribute to hunger.

One of the central aspects of Sen's theory is the idea of 'entitlement' in combination with 'command'. He holds that political and economic systems are essential in creating an enabling

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[22] Peter Oosterveer and David Allan Sonnenfeld, *Food, Globalization and Sustainability* (Abingdon; New York: Earthscan, 2012), 43.
[23] See, for example, for some critical views of Malthusian theory: Chris Williams, 'Are There Too Many People? Population, Hunger, and Environmental Degradation' *International Socialist Review* 68 (2010), http://isreview.org/issue/68/are-there-too-many-people, last accessed on 22 July 2015.
[24] Oxfam Canada, 'There Is Enough Food to Feed the World', http://www.oxfam.ca/there-enough-food-feed-world, last accessed on 22 July 2015.
[25] See, for example: World Food Programme, 'Hunger FAQS', http://www.wfp.org/hunger/faqs, last accessed on 22 July 2015.
[26] Sen, note 16 above, 1.
[27] Vernon, note 13 above , 17.
[28] Butterly and Shepherd, note 20 above, 11-15.

environment in which all people are able to access the necessary food for subsistence. Entitlement indicates the ability to command – or acquire – adequate food. Command of food is dependent not only on its availability, but also, and importantly, on political and economic conditions that allow access to food.[29] Improving people's economic situations and ensuring democratic governance within countries, according to Sen, will lead to better access and distribution of food, and subsequently will reduce hunger and starvation. Hunger is ultimately not caused by technical limitations relating to production and availability, but primarily by political and economic limitations impeding some people's access to available food.

These brief descriptions of dominant perceptions of hunger based on ideas put forth by Malthus and Sen are intended to illustrate two influential ways in which hunger is understood, articulating either lack of availability or lack of access to food as the main source of hunger. Perceptions of hunger shape the types of strategies devised to address it. When exploring hunger in the context of climate change, it is therefore useful to establish how hunger is perceived by different actors. The next chapters in this thesis will show that both physical scarcity of food and socio-economic inability to access food are very relevant in contemporary discussions of hunger in the context of climate change.

This research is interested primarily in the role that law plays in providing ways to tackle climate-induced hunger. The next section will explain how hunger has come to be viewed as a problem of human rights, particularly the right to food.

1.3 HUNGER AS A HUMAN RIGHTS ISSUE

Contradictions exist in the attribution of causation of hunger, placing more emphasis on either availability of food or access to food, but either way, hunger is considered a problem. The late Michel Cepède noted, in an article from 1984, that 'although the fight against hunger is the oldest of man's battles, it only became a global human enterprise after the Second World War'.[30] The way in which international law developed since the second half of the 20th century coincided with the emergence of hunger and other issues as global human enterprises. The creation of the United Nations Organization in 1945 is the clearest embodiment of efforts to ensure peace and security through international law.

The specific focus on food security and hunger as global problems dates back to the 1970s, with the first World Food Conference held in 1974. The World Food Conference called

[29] Liz Young, *World Hunger*, Routledge Introductions to Development (London; New York: Routledge, 1996), 5-6.
[30] Michel Cépède, 'The Fight against Hunger: Its History on the International Agenda' *Food Policy* 9 (1984), 282.

for active effort on the part of national governments and the international community to eliminate hunger and malnutrition. At this conference, freedom from hunger was explicitly recognized as a 'right': '[E]very man, woman and child has the inalienable right to be free from hunger and malnutrition in order to develop their physical and mental faculties.'[31] Taking this into account, hunger can be viewed as a threat or potential violation of human rights; as a problem of international law. Over the past half century, an increasing number of international legal instruments have emerged in relation to the 'right to adequate food', and other rights connected with nutritional concerns.[32] The human right to food has developed and expanded significantly in the period since 1948, when it was incorporated into the Universal Declaration of Human Rights.[33]

The perception of access to adequate food and freedom from hunger as a human *right* reflects Sen's concepts of entitlement and command.[34] Hunger does not happen inevitably, and active measures must be taken to ensure that the political, economic, and legal conditions are met to realize the right to food. Rights impose obligations, most obviously in the form of states taking active measures to prevent hunger.[35] Framing the issues of hunger and food security in the language of rights has influenced the way in which these concepts are understood. The hungry are viewed not primarily as culprits responsible for their own condition, or as helpless victims in need of aid, but rather as individuals who should be capable – with the help of a solid legal framework that contributes to providing the right conditions – of remaining free from hunger.

Apart from influencing the perception of hunger, constructing hunger as a problem of human rights also informs the possible solutions to this problem. This is particularly evident in the manner in which human rights are used. Applying human rights standards – and especially the right to food – is a means of ensuring that individuals are free from hunger. Although the relevance of the right to food is perhaps most apparent, other areas of law are very relevant as well, both in framing hunger as a problem and in finding solutions. Different areas of law will be

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[31] United Nations, 'Key Conference Outcomes on Food', http://www.un.org/en/development/devagenda/food.shtml, last accessed on 22 July 2015.

[32] Arne Oshaug, Wenche Barth Eide, and Asbjørn Eide, 'Human Rights: A Normative Basis for Food and Nutrition-Relevant Policies' *Food Policy* 19 (1994), 491.

[33] United Nations General Assembly, 'Universal Declaration of Human Rights' (10 December 1948), Article 25(1): 'Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.' Chapter 4 of this thesis will elaborate more on the right to food.

[34] Sen, notes 16 and 26 above.

[35] Crossgrove et al. write that '[i]f access to food is viewed as a basic human right, then starvation and malnutrition are violations of that right, and governments are expected to strive to eliminate famine and malnutrition'. William Crossgrove et al., 'Colonialism, International Trade, and the Nation-State' in *Hunger in History: Food Shortage, Poverty and Deprivation*, ed. Lucile F. Newman and William Crossgrove (Oxford: Basil Blackwell, 1989), 233.

discussed in subsequent chapters. This research intends to expose that law is not only pertinent to formulating and guiding solutions to hunger, but it also influences the way in which hunger is perceived, and thereby establishes the framework within which solutions can be found.

This research draws on food regime theory – an analytical tool to understand global food relations – as a theoretical framework through which the role of law in addressing hunger in the context of climate change is studied. The next part of this chapter will elaborate on food regime theory.

2 FOOD REGIMES

Hunger is contingent on the availability of food and access to food. How food is produced, traded, distributed, and consumed, is dependent on the political, social, and economic circumstances. The combination of these circumstances can be designated 'food regimes'.[36] Food regime theory identifies and analyses the lineaments of different food regimes, and seeks to understand the role of agriculture in larger systems of global governance, particularly modes of capital accumulation. This part of the chapter will explain food regime theory and focus especially on the current, 'neoliberal' food regime. Food regime theory was coined and is used mostly by sociologists and geographers. Legal perspectives are not part of food regime analysis.[37] By answering the main research questions about the role of law in finding solutions to climate-induced hunger, this study also demonstrates the relevance of law for food regime theory.

The first section will denote food regime theory, and briefly outline the characteristics of previous food regimes. The second section will explore the current 'neoliberal' food regime in more detail. The third section will identify food sovereignty movements as modes of resistance within the neoliberal food regime.

[36] Bill Pritchard, 'Food Regimes' in *The International Encyclopedia of Human Geography*, ed. Rob Kitchin and Nigel Thrift (London: Elsevier, 2009).

[37] Of the articles read about food regime theory in this research, none mentioned law or included legal analysis. I could also not find any legal literature that refers to food regime theory. See also: Chapter 5 at note 3.

2.1 FOOD REGIME THEORY

Harriet Friedmann and Philip McMichael pioneered 'food regime theory' in the late 1980s.[38] Food regime theory attempts to explain food relationships in the context of world development. McMichael points out that food regime analysis 'emerged to explain the strategic role of agriculture and food in the construction of the world capitalist economy'[39] and 'to situate the world food system and its crisis within a broader historical understanding of geopolitical and ecological conditions'.[40] The concept of food regimes has 'brought together insights from regulation theory and world-systems theory, and applied these to the politics of food'.[41] World-systems theory[42] attempts to analyse the capitalist economy through a multi-disciplinary approach, particularly breaking down the barriers between social sciences and history.[43] In terms of food regime theory, a world systems analysis allows the politics and economy of food to be studied in the context of specific historical conditions and circumstances.[44] Regulation theory[45] studies the tendencies or laws that support modes of capital accumulation, and how they are influenced by the historical and social conditions. Insights from regulation theory led food regime theorists to focus also on the modes of regulation that supported food relations at specific points in history.[46] An important aspect of food regime theory is hegemony, or rather, the identification of a 'hegemonic economic power [that] underwrote a specific system of agri-food production and trade'.[47] Specific periods that can be identified are labeled 'food regimes'.

Friedmann and McMichael have identified two food regimes. The first food regime ranged from the late 19th century until the early 20th century, and Friedmann called it the *colonial-*

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[38] Respectively, Professor of Geography and Planning, University of Toronto and Professor of Development Sociology, Cornell University. Harriet Friedmann and Philip McMichael, 'Agriculture and the State System: The Rise and Fall of National Agricultures, 1870 to the Present' *Sociologia Ruralis* 29 (1989), 93-117.
[39] Philip McMichael, 'A Food Regime Genealogy' *The Journal of Peasant Studies* 36 (2009), 139.
[40] Ibid.
[41] Bill Pritchard, 'The Long Hangover from the Second Food Regime: A World-Historical Interpretation of the Collapse of the WTO Doha Round' *Agriculture and Human Values* 26 (2009), 299.
[42] World systems theory, or analysis, is attributed to the work of Immanuel Wallerstein, a sociologist who took a historical approach to studying the links between development and capitalism. Immanuel Wallerstein. *The Modern World System I: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century* (New York: Academic Press, 1974); Immanuel Wallerstein. 'A World-System Perspective on the Social Sciences' *The British Journal of Sociology* 61 (2010), 167-176.
[43] See, for instance: Salvatore Babones. 'What is World-Systems Analysis? Distinguishing Theory from Perspective' *Thesis Eleven* 127 (2015), 3–20.
[44] Pritchard 2009, note 41 above, 299.
[45] See, for example: Robert Brenner and Mark Glick. 'The Regulation Approach: Theory and History' *New Left Review* I/188 (July-August 1991).
[46] Pritchard 2009, note 41 above, 299.
[47] Ibid., 298.

diasporic regime.[48] This regime was set within the European colonial context. Some of its main features were the distribution of seeds and crops from the colonies to Europe, and conversely the dissemination of farming practices to the colonies.[49] The production of staple foods, such as wheat and maize, was outsourced to the settler colonies in the Americas, and then imported to Europe and other European colonies.[50] These imports from the colonies provided the provisions needed for the emerging industrial classes of Europe.[51] The first food regime saw the rise of global wheat markets.

The collapse of the world wheat markets and the Great Depression of the 1930s prompted the end of the first and the emergence of the second food regime, which Friedmann labelled the *mercantile-industrial* regime. This regime materialized in the 1940s, after the end of the Second World War,[52] and its main features included industrialization and the production of surplus food. This surplus food was subsequently traded. Therefore, global food trade and export subsidies were introduced.[53] The Cold War was an important element of the political and economic context for the second food regime. Food aid was used as a political tool, to secure 'loyalty against communism and to imperial markets'.[54] The second food regime also included the introduction of new agricultural technologies in an effort to increase crop yields in developing countries, particularly in Asia. This occurred under the banner of the Green Revolution, and consisted of importing 'western' forms of agricultural technology to countries of the global south.[55]

The first and the second food regime are part of 'larger periods of stability in relations of power and property'.[56] In the first food regime, the hegemonic power that provided this stability was England; in the second food regime, the hegemonic power was the US.[57] Although food regimes reflect periods of stability, food regime theory emphasizes periods of crisis and

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[48] Harriet Friedmann, 'From Colonialism to Green Capitalism: Social Movements and Emergence of Food Regimes' in *New Directions in the Sociology of Global Development*, ed. Frederick H. Buttel and Philip McMichael (Elsevier, 2005), 241-242.
[49] Ibid., 260.
[50] McMichael 2009, note 39 above, 141.
[51] Eric Holt-Giménez, 'Food Security, Food Justice, or Food Sovereignty? Crises, Food Movements, and Regime Change' in *Cultivating Food Justice: Race, Class, and Sustainability*, ed. Alison Hope Alkon and Julian Agyeman (Cambridge, MA; London, UK: MIT Press, 2011), 313. See also: McMichael 2009, note 39 above, 141.
[52] Friedmann 2005, note 48 above, 241-243.
[53] McMichael 2009, note 39 above, 141.
[54] Ibid., 141.
[55] See, for more information about the Green Revolution, section 3.2 below, especially at notes 150 and 151.
[56] Friedmann 2005, note 48 above, 228.
[57] Pritchard 2009, note 41 above, 304.

transition. Periods of crisis – such as the Great Depression – trigger the emergence of a new regime in which food relations are reconfigured. [58]

Some have criticized food regime theory for failing to take into account local and regional food systems.[59] Acknowledging its limitations, food regime theory does not propose to be a comprehensive treatment of all agricultural systems, local and global.[60] Nonetheless, it has been influential in defining and teasing out the main features of global food relations.[61] There has been a recent re-emergence of interest in food regime theory, after its initial coining by Friedmann and McMichael in the late 1980s.[62] McMichael has stated that the food regime concept 'is still in formation, especially now with the conjunction of energy, food, and climate crises'.[63] These crises facing global food relations are destabilizing the regime, and have led theorists to anticipate the emergence of a third food regime.

2.2 THE NEOLIBERAL FOOD REGIME

The second food regime has encountered a number of challenges, including the persistence, and the growing visibility, of a global food crisis characterized by volatile prices and increasing critiques of environmental deterioration connected to agricultural practices and industrialization.[64] Many theorists contend that a third food regime is emerging in this period of crisis.[65] The second food regime has been explained as a regime focused primarily on national economies;[66] while the third food regime is characterized as an extension of capital accumulation

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[58] Hugh Campbell, 'Breaking New Ground in Food Regime Theory: Corporate Environmentalism, Ecological Feedbacks and the 'Food from Somewhere' Regime?' *Agriculture and Human Values* 26 (2009), 309.

[59] For instance, Goodman and Watts have argued that food regime theory focuses too uncritically on the industrial restructuring narrative as a driver for food regimes, and foregoes other considerations that affect the formation and delineations of food regime. David Goodman and Michael Watts, 'Reconfiguring the Rural or Fording the Divide?: Capitalist Restructuring and the Global Agro-Food System' *Journal of Peasant Studies* 22 (1994), 1-49.

[60] McMichael 2009, note 39 above, 140.

[61] David Burch and Geofrrey Lawrence, 'Towards a Third Food Regime: Behind the Transformation', *Agriculture and Human Values* 26 (2009), 268.

[62] This renewed interest is evidenced in a special 'Agriculture, Food and Human Values' symposium organized in Canada in 2007. Discussions during this symposium centred around food regime analysis, and culminated in a special issue of *Agriculture and Human Values* in 2009 about food regime analysis. See: Hugh Campbell and Jane Dixon, 'Introduction to the Special Symposium: Reflecting on Twenty Years of the Food Regimes Approach in Agri-Food Studies' *Agriculture and Human Values* 26 (2009), 261-265.

[63] McMichael 2009, note 39 above, 142.

[64] Pritchard 2009, note 36 above, 8.

[65] There are debates about whether a third food regime has been established or whether the lineaments of a third food regime are still emerging. These debates will not be addressed in this research. Whether or not a third food regime is established or still emergent, its dominant features remain the same.

[66] Gerardo Otero, 'The Neoliberal Food Regime in Latin America: State, Agribusiness Transnational Corporations, and Biotechnology', in *The Neoliberal Regime in the Agri-Food Sector*, ed. Steven A. Wolf and Alessandro Bonanno (London, UK; New York, US: Earthscan, Routledge, 2014), 227.

through food on a global scale.[67] Friedmann identified the 1974 World Food Conference as the beginning of this third food regime.[68] The World Food Conference framed the 'problem' of food production and distribution in terms of a problem of 'hunger', a global problem of people lacking food. The emergence of the third food regime coincides with the viewing of hunger as a threat and potential violation to human rights, and human rights as part of the solution to hunger.[69]

The rise of the third food regime coincides also with neoliberal capitalism. Neoliberalism is defined as a 'theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets, and free trade'.[70] The role of the state in neoliberal political economy is limited: the state is tasked with creating an institutional framework that allows the aforementioned conditions.[71] Meanwhile, non-state actors, notably corporations, are gaining more influence. One of the central ideas behind neoliberalism is that poverty can be eliminated through free markets and trade.[72] It is closely linked to the idea of 'accumulation by dispossession', coined by David Harvey. Accumulation by dispossession describes centralization of power and concentration of wealth in the hands of a few entities through the possession of public property.[73] The World Trade Organization (WTO) contains important international agreements related to free trade and property rights. For this reason, the WTO as an institution is important for the rise of neoliberalism.[74]

Neoliberal political economy has influenced global agriculture. The WTO contains important provisions relating to agriculture, for instance the Agreement on Agriculture (AoA).[75] Free market access is one of the pillars of the AoA. With regard to this Agreement, McMichael wrote that 'a system of "free trade" in agricultural products was installed to privatize food

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[67] Ibid. See also: Philip McMichael. 'Tensions Between National and International Control of the World Food Order: Contours of a New Food Regime' *Sociological Perspectives* 35(1992), 343–65.
[68] Friedmann 2005, note 48 above, 241-242.
[69] See section 1.3 above.
[70] David Harvey, *A Brief History of Neoliberalism* (Oxford: Oxford University Press, 2007), 2.
[71] Ibid.
[72] Ibid., 64-65.
[73] David Harvey, *The New Imperialism*, 2003 ed. (Oxford: Oxford University Press, 2003), 145. McMichael also explicitly refers to Harvey's concept of accumulation by dispossession in his discussions of the corporate food regime, see: Philip McMichael, 'Global Development and the Corporate Food Regime' in *New Directions in the Sociology of Global Development*, ed. Frederick H. Buttel and Philip McMichael (Elsevier, 2005), 266.
[74] Harvey 2007, note 70 above, 66.
[75] 'Agreement on Agriculture', 15 April 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1a, in *The Legal Texts: The Results of the Uruguay Round of Multilateral Trade Negotiations* 33, 1867 U.N.T.S. 410 (1999).

security as a global, corporate relation'.[76] One feature of accumulation by dispossession is 'privatization and commodification', 'to open up new fields for capital accumulation'.[77] Commodification refers to the turning of goods into marketable products. By turning agricultural products in market goods, food and agriculture becomes a 'new field' opened up for 'capital accumulation'. Harvey notes that: '[C]ommodification presumes the existence of property rights over processes, things, and social relations, that a price can be put on them, and that they can be traded subject to legal contract'.[78]

The WTO also included an Agreement on Trade-Related Aspects of Intellectual Property (TRIPS).[79] TRIPS defines plant genetic materials as private property.[80] The TRIPS Agreement allows plant genetic materials, including food seeds and crops, to be subject to private property rights: a condition for commodification. Agricultural biotechnology corporations are increasingly filing patent applications on seeds for food production, thereby gaining temporary exclusive property rights over those seeds.[81] Large private seed corporations are the most dominant players in the application of patent rights on seeds and crops,[82] and are more generally dominant players in global food production.[83] Oosterveer and Sonnenfeld take note of this rise in power of corporations in the food sector.[84]

These 'neoliberal' processes of commodification and corporatization that mark the current food regime, portray a global food system dominated by private corporations that advocate the realization of food security, and the end of hunger through free trade and open markets. In the emerging third food regime, the problems of hunger and food security are addressed through trade liberalization that encourages universal trade of agricultural products, and 'requires states in the global South to open their economies to the North-dominated

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[76] McMichael 2005, note 73 above, 276.
[77] Harvey 2007, note 70 above, 160.
[78] Ibid., 165.
[79] Agreement on Trade-Related Aspects of Intellectual Property Rights, 15 April 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, in *The Legal Texts: The Results of the Uruguay Round of Multilateral Trade Negotiations* 1869 U.N.T.S. 299; 33 I.L.M. 1197, 1994.
[80] Harvey 2007, note 70 above, 160.
[81] The application of patent rights on seeds will be addressed in more detail in Chapter 3 of this research.
[82] See, for instance: Global Knowledge Centre on Crop Biotechnology, 'Pocket K No. 9: Intellectual Property Rights and Agricultural Biotechnology', International Service for the Acquisition of Agri-Biotech Applications (ISAAA), https://www.isaaa.org/resources/publications/pocketk/9/default.asp, last accessed on 22 July 2015. The ISAAA states that intellectual property rights on agricultural biotechnologies are 'predominantly owned by the private sector'. Specific information about US markets suggests that the private sector corporations 'tend to dominant in plant technological and molecular level agricultural biotechnology'. Paul W. Heisey, John L. King, and Kelly Day Rubenstein, 'Patterns of Public-Sector and Private-Sector Patenting in Agricultural Biotechnology', *Agbioforum* (The Journal of Agrobiotechnology Management and Economics), 8 (2005), 73.
[83] Gabriela Pechlaner and Gerardo Otero, 'The Third Food Regime: Neoliberal Globalism and Agricultural Biotechnology in North America' *Sociologica Ruralis* 48 (2008), 366.
[84] Oosterveer and Sonnenfeld, note 22 above, 18.

international food trade, dismantle farm sector protections and adopt intellectual property protections'.[85] McMichael refers to the privatization of agricultural knowledge as 'a principal feature of the corporate food regime'.[86]

Different labels have been attached to the emerging third food regime. McMichael refers to the third food regime as *corporate*; Friedmann calls it the *corporate-environmental* regime.[87] 'Corporate' signals the growing power of private corporations in global food systems. 'Environmental' hints to growing concerns of, and pressures from, social movements to give more attention to issues related to the 'environment' and more social concerns – including biodiversity, climate change, food safety, animal welfare, etc.[88] Other theorists have classified this food regime more broadly as 'neoliberal'.[89] McMichael has written that '[t]he distinguishing mark of the corporate food regime as a new moment in world capitalism lies in the politics of neo-liberalism'.[90] In this research, the term 'neoliberal food regime' will be used to denote the regime that is currently emerging.

Food regime theorists have associated the third or neoliberal food regime with a number of features. These include the rise in interest in organic and healthy foods;[91] the powerful role of supermarkets as suppliers;[92] and changes to the financial system that influence global food relations.[93] In this research, the focus will be on the combination of the rising influence of private sector agricultural biotechnology corporations and the increasing intellectual property rights over seeds and food (notably through patent rights as stipulated in the TRIPS Agreement). These features are closely related to the rise of neoliberal capitalism and the WTO. Friedmann wrote in 2009 that: 'WTO intellectual property rules underpin the move of agri-food corporations into spaces occupied by small farmers. … This opens the question of new elements, which are potential pivots of a new food regime.'[94]

Friedmann emphasizes that, during the first World Food Conference in 1974, the possibility that markets themselves might contribute to increasing vulnerability to hunger was

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85 Philip McMichael, 'The Land Grab and Corporate Food Regime Restructuring' *Journal of Peasant Studies* 39, 2012, 682.
86 McMichael 2005, note 73 above, 281.
87 Friedmann 2005, note 48 above, 241-242.
88 Ibid., 229.
89 See, for instance: Pechlaner and Otero, note 83 above.
90 McMichael 2005, note 73 above, 273.
91 Burch and Lawrence 2009, note 61 above, 267; Friedmann 2005, note 48 above, 229; McMichael 2009, note 39 above, 142.
92 David Burch and Geoffrey Lawrence, 'Supermarket Own Brands, Supply Chains and the Transformation of the Agrofood System' *International Journal of the Sociology of Agriculture and Food*, 13 (2005) 1–18. See also: Tim Lang and Michael Heasman. *Food Wars. The Global Battle for Mouths, Minds and Markets*. London: Earthscan, 2004.
93 Burch and Lawrence 2009, note 61 above, 267.
94 Harriet Friedmann, 'Moving Food Regimes Forward: Reflections on Symposium Essays' *Agriculture and Human Values* 26 (2009), 340.

not considered.[95] Global hunger is still rampant,[96] and expected to be exacerbated as a result of adverse impacts of climate change. New agricultural biotechnologies, private sector investments, and free global food markets have not yet eradicated or significantly alleviated hunger. On the contrary, some theorists argue that the neoliberal features of the emerging food regime have widened the gap between rich and poor, and have aggravated global hunger. Friedmann, for instance, writes about the shifting balance from public to private regulation of the world food system, which – in her view – will 'widen the gap between privileged and poor consumers as it deepens commodification and marginalizes existing peasants'.[97] In a similar fashion, Elisabeth Abergel attributes 'the growing inequalities within the food system between North and South, which give rise to recurring food crises', to the neoliberal restructuring of food networks, both local and global.[98]

McMichael and Friedmann have written that while earlier food regime analyses focused on periods of stability, contemporary food regime analysis highlights 'the profound conditions of instability of the agrofood system'.[99] One such condition of instability central to the neoliberal food regime is 'between the globalization of corporate agriculture and countermovements informed by food sovereignty principles'.[100] The next section will look into the concept of food sovereignty in relation to the neoliberal food regime.

2.3 FOOD SOVEREIGNTY AS RESISTANCE TO THE NEOLIBERAL FOOD REGIME

The prevailing neoliberal conviction is that 'trade liberalisation will always bring net benefits to all participants',[101] and this conviction is evident in the lineaments of the third food regime. Four decades after the 1974 World Food Conference, close to one billion people are suffering from hunger, and there are serious doubts whether a neoliberal system can truly bring net benefits to all participants. McMichael has written that:

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[95] Friedmann 2005, note 48 above, 241-242, 245.
[96] See, for instance, figures from the FAO report 'The State of Food Insecurity in the World 2015', Introduction at notes 12-14.
[97] Friedmann 2005, note 48 above, 228.
[98] Elisabeth A. Abergel, 'Climate-Ready Crops and Bio-Capitalism: Towards a New Food Regime?' *International Journal of Sociology of Agriculture and Food* 18, 3 (2011), 262-262.
[99] Philip McMichael and Harriet Friedmann, 'Situating the 'Retailing Revolution' in *Supermarkets and Agrofood Supply Chains: Transformations in the Production and Consumption of Foods* ed. David Burch and Geoffrey Lawrence (Cheltenham: Edward Elgar, 2007), 295-296.
[100] Otero, note 66 above, 227.
[101] Peter Einarsson, 'The Disagreement on Agriculture' *Seedling* (March 2001).

> [h]istoricising food regime politics has the potential to transcend the increasingly discredited episteme of capital accumulation and advocate agricultural reorganisation according to socially and ecologically sustainable practices. This is the centrality of the food regime in the twenty-first century.[102]

Agricultural 'reorganisation according to socially and ecologically sustainable practices' has been promoted compellingly through the concept of 'food sovereignty'. Peasant movement La Via Campesina first coined the term 'food sovereignty' at the World Food Summit in 1996. Food sovereignty refers to 'the right of peoples to healthy and culturally appropriate food produced through sustainable methods and their right to define their own food and agriculture systems'.[103] The main idea behind this concept is to place small-scale producers, consumers, and distributors of food at the centre of the food system, rather than placing control of global food systems in the hands of large corporations in the name of efficiency and productivity.[104] Since its introduction, food sovereignty, as a social movement and a framework within which to discuss food systems, has been adopted and reinterpreted by numerous civil society groups, NGOs, and human rights organizations. It is considered a grassroots movement, initiated and driven by farmers and farmers' organizations.[105] Philip McMichael has written that '[f]ood sovereignty is a culminating protective movement against the deceit of "feeding the world" by undermining farming with the false economy of value relations of the food regime'.[106]

Food sovereignty aims to reject the tenets of the neoliberal food regime.[107] Some even regard food sovereignty as a possible development of a 'new, alternative paradigm and driver of change challenging the current food regime, in its efforts to reembed economic, environmental, and equity-related concerns around agricultural production, consumption, and trade'.[108] Raj Patel states that food sovereignty 'offers a profound agenda for change for everyone … [as it] aims to

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[102] McMichael 2009, note 39 above, 164.
[103] La Via Campesina, 'The International Peasant's Voice', http://viacampesina.org/en/index.php/organisation-mainmenu-44, last accessed on 22 July 2015.
[104] See, for example: World Development Movement, 'What Is Food Sovereignty?', http://www.wdm.org.uk/what-food-sovereignty, last accessed on 22 July 2015.
[105] McMichael cites Hannah Wittman, who defines the concept of food sovereignty 'not as an established paradigm/concept but rather a potential new framework emerging from diverse set of contemporary grassroots production practices and political approaches'. Philip McMichael, 'La Restructuration Globale Des Systèmes Agro-Alimentaires' *Mondes en Développement* 30 (2002), 88.
[106] Philip McMichael, 'Historicizing Food Sovereignty: A Food Regime Perspective' a paper presented at the conference *Food Sovereignty: A Critical Dialogue Conference* (International Conference Yale University, 14-15 September 2013, paper #13), 1.
[107] See, for example: Alison Hope Alkon, 'Food Justice, Food Sovereignty and the Challenge of Neoliberalism' A paper presented at the conference *Food Sovereignty: A Critical Dialogue Conference*, paper no.38, International Conference Yale University, 14-15 September 2013.
[108] McMichael 2002, note 105 above, 90. See also Table 1 on page 91 for an overview of differences between the corporate/neoliberal food regime and a possible emerging new food regime based on principles of food sovereignty.

redress the abuse of the powerless by the powerful, wherever in the food system that abuse may happen'.[109] Eric Holt-Giménez and Annie Shattuck promote the idea that food sovereignty as a movement has the potential to change the global food regime, leading it away from the neoliberal one.[110]

One central element of criticism put forth in food sovereignty movements is that the concept of food security has become situated within the same market logic that underlies the neoliberal food regime. As noted above, the neoliberal food regime views free trade and marketization of food as a primary means to achieve food security.[111] McMichael articulates the food sovereignty movement as a critique of 'neoliberal food security' – seeking to attain food security through free trade – and contends that food security should be about 'food as a right, not a commodity'.[112] In this sense, McMichael does not reject the importance of food security, but rather argues that food sovereignty is a premise for genuine food security. The key point is that food should be used as a source of nutrition rather than a commodity.[113]

Food sovereignty is strongly related to 'rights'. Patel invokes Hannah Arendt's notion of the 'right to have rights' to define the core of the food sovereignty movement: invoking the right to have rights over food.[114] The central insight is that hunger should not only be addressed by increasing food production and enabling all persons to physically and economically access food, but also and importantly by giving people the capability to decide for themselves what to produce, how to produce it, and how to distribute and consume it. Food sovereignty is considered a prerequisite for attaining food security, for realizing everybody's right to food, and ultimately for eradicating hunger.[115] Promoters of food sovereignty proffer the realization of the right to food as a necessary instrument through which to achieve food sovereignty.[116]

One of the main contentions within the neoliberal food regime is that hunger cannot be eradicated within a corporate food market. The way that global food systems are currently

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[109] Raj Patel, *Stuffed and Starved: Markets, Power and the Hidden Battle for the World Food System* (London: Portobello, 2007), 302.

[110] Eric Holt Giménez and Annie Shattuck, 'Food Crises, Food Regimes and Food Movements: Rumblings of Reform or Tides of Transformation?' *The Journal of Peasant Studies* 38 (2011). See also: 'Agreement on Agriculture', note 75 above, 2-3.

[111] See above in sections 1.2 on food security and 2.2 on the neoliberal food regime.

[112] McMichael 2013, note 106 above, 6.

[113] McMichael 2005, note 73 above, 286.

[114] Raj Patel, 'Grassroots Voices: Food Sovereignty' *The Journal of Peasant Studies* 36 (July 2009), 663.

[115] See, for example: La Via Campesina Press Release: The Right to Food Is Now the Framework for the Food Security Framework Policy', http://viacampesina.org/en/index.php/main-issues-mainmenu-27/food-sovereignty-and-trade-mainmenu-38/1318-the-rights-to-food-are-now-the-basis-for-the-food-security-framework-policy, last accessed on 22 July 2015.

[116] See, for example: Michel Pimbert, 'Towards Food Sovereignty', *Gatekeeper* 141 (November 2009), International Institute for Environment and Development (IIED), especially box 2 on page 6, and in citing Patel (*Stuffed and Starved*, 2007, see note 109 above) on page 14.

structured may even increase inequalities and aggravate problems of hunger, as the citations by Friedmann and Abergel above illustrate.[117] Proponents of the food sovereignty movement advocate it as a framework that can provide 'real solutions' to hunger.[118] Food regime theorists have argued that opposition to the neoliberal food regime could lead to the emergence of a new regime. Both Friedmann and Abergel suggest that a new food regime – or at least a new articulation in the consolidation of the current food regime – could include more emphasis on locally produced food, on more sustainable agricultural practices, and a greater role for the public sector.[119] Abergel specifically writes that tensions within the neoliberal food regime could lead to a new regime that 'might include potential variations within it that allow local food policies with features of the "food sovereignty" approach'.[120]

The tensions that are evident in the current/emerging food regime between neoliberal features and food sovereignty movements, constitute the theoretical framework of this research. Friedmann has explained that '[r]egime means regulation: there exist "rules" which analysts can infer through consistent behaviors of relevant actors: states, enterprises, corporations, social movements, consumers, and scientists.'[121] Food regime analyses have been done mostly by sociologists and geographers, as the references to the literature on food regime theory indicate. This thesis applies a legal perspective to food regime analysis, arguing that 'regulation' and 'rules' are in part reflected through law, and that law and legal discourse in part reflect behaviours of relevant actors.

In terms of the neoliberal food regime and the central tension between corporate agriculture and food sovereignty movements, international law plays a role most evidently through the TRIPS Agreement and through rights discourse. The TRIPS Agreement has allowed corporations to obtain temporary, exclusive patent rights over seeds and crops for food production. Food sovereignty movements invoke human rights, and particularly the right to food, as a way to centre attention on individuals rather than corporations. The role that international law plays in navigating the tensions within the neoliberal food regime will be studied through the example of one proposed strategy to deal with the predicted exacerbated hunger in the context of climate change. This proposed adaptation strategy will be introduced and explained in the next part of this chapter.

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[117] See: Friedmann 2005, note 97 above; Abergel 2011, note 98 above.
[118] See: La Via Campesina, 'October 16: La Via Campesina Celebrates World Food Sovereignty Day, Demands Real Solutions to End Hunger', http://viacampesina.org/en/index.php/main-issues-mainmenu-27/food-sovereignty-and-trade-mainmenu-38, last accessed on 22 July 2015.
[119] Friedmann 2005, note 48 above; Abergel 2011, note 98 above.
[120] Abergel 2011, note 98 above, 272.
[121] Friedmann 2009, note 94 above, 336.

3 CLIMATE-READY SEEDS

The final part of this chapter will explain the relationship between climate change and hunger and explore one proposed adaptation strategy to deal with the predicted losses in crop yields in the face of climate change. The first section will discuss climate change and hunger. The second section will introduce climate-ready seeds as a proposed adaptation strategy in this context, and the third section will outline different narratives of climate-ready seeds, centred on the question of whether these seeds can contribute to fighting climate-induced hunger. The fourth and last section will argue that contradictory narratives of climate-ready seeds exemplify the tensions within the neoliberal food regime. These narratives lay the groundwork for the exploration of the role of law in later chapters.

3.1 CLIMATE CHANGE AND HUNGER

The adverse impacts of climate change are often related to increased food insecurity and hunger. This is so because agriculture is considered one of the most vulnerable sectors to the impacts of climate change.[122] Conditions such as droughts, higher average temperatures, increased salinity, and more instances of storms and other extreme weather events, are already affecting, and will continue to affect, the types and amounts of crops that can grow.[123] People have long since understood that there exists a strong relationship between climate and hunger. In the 1970s, Reid Bryson and Thomas Murray published a book entitled *Climates of Hunger*,[124] in which they explored the way in which mankind deals with changing climates and their impact on hunger. Bryson and Murray defined 'climates of hunger' as climates that 'no longer support the crops and herds, berries, fruits, and game they once did'.[125]

Climate variability, as predicted to occur with current climate change, has a significant impact on crop yields. In one of many projections, with an assumed 4.4ºC increase in average global temperature and a 2.9 per cent increase in precipitation by 2080, the decrease in global

[122] See, for instance: Mark Rosegrant et al., 'Climate Change and Agriculture: Threats and Opportunities', GTZ on behalf of the Federal Ministry for Economic Cooperation and Development (Eschborn, Germany, 2008); Gerard C. Nelson et al., 'Climate Change: Impact on Agriculture and Costs of Adaptation' (Washington D.C.: International Food Policy Research Institute, 2009); Anne Moorhead, 'Climate, Agriculture and Food Security: A Strategy for Change' (The Alliance of the Consultative Group on International Agricultural Research Centres, 2009).
[123] Ibid.
[124] Reid A. Bryson and Thomas J. Murray, *Climates of Hunger: Mankind and the World's Changing Weather* (Madison, 1977).
[125] Ibid., 3.

agricultural output potential is estimated to be 6 per cent.[126] Recent research published in *Nature* suggests that 'climate variation explains a third of global crop yield variation'.[127] Through extensive studies, the authors confirm that 'not all crop growing regions showed statistically significant influence of year-to-year variations in climate on crop yield variability'.[128] Nevertheless, their results also show that 'the vast majority of crop harvesting regions did experience the influence of climate variability on crop yields'[129] and that 'in specific locations, within the top global crop production regions, climate variability accounted for >60% of the variability in a crop's yield'.[130] This study affirms that climate change has a substantial impact on agricultural crop yields.

These impacts are not spread out evenly. Agriculture in some regions – particularly in parts of Russia, Canada, and Scandinavia – is predicted to benefit from slight increases in average temperatures.[131] It is the developing world that will suffer the brunt of the adverse consequences of climate change on agriculture.[132] This is partly because regions such as sub-Saharan Africa and many parts of Asia already have a warmer climate, and already suffer more from droughts and floods. Another important reason for their increased vulnerability as compared to the developed world is their relative lack of adaptive capability.[133] The Intergovernmental Panel on Climate Change (IPCC) in its fourth assessment report links agricultural production directly to food security and malnutrition in the context of Africa by stating that:

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[126] Olivier De Schutter, 'Large-Scale Land Acquisitions and Leases: A Set of Core Principles and Measures to Address the Human Rights Challenge' (OECD, 11 June 2009), 7.
[127] Deepak K. Ray et al., 'Climate Variation Explains a Third of Global Crop Yield Variability' *Nature Communications* 6, January 2015, http://www.nature.com/ncomms/2015/150122/ncomms6989/full/ncomms6989.html, last accessed on 22 July 2015.
[128] Ibid., 2.
[129] Ibid., 2. Specifically, the authors name the following crops: '~70% of maize harvesting regions, ~53% of rice harvesting regions, ~79% of wheat harvesting regions and ~67% of soybean harvesting regions'.
[130] Ibid., 2.
[131] See, for example: International Institute for Sustainable Development and Environmental Adaptation Research Group – Institute for Environmental Studies, 'Agriculture and Climate Change: A Prairie Perspective (Draft)' (Toronto: University of Toronto, March 1997), http://www.iisd.org/pdf/agriculture_climate.pdf, last accessed on 22 July 2015; Gregg Easterbrook, 'Global Warming: Who Loses – and Who Wins?' *The Atlantic* 1 April 2007, http://www.theatlantic.com/magazine/archive/2007/04/global-warming-who-loses-and-who-wins/305698/, last accessed on 22 July 2015.
[132] See, for example: 'Climate Change 2014: Synthesis Report.' Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, ed. R.K. Pachauri and L.A. Meyer (Geneva, Switzerland: IPCC 2014), especially on page 55 on 'exposure and vulnerabilities'.
[133] To give a clear example of this, both Bangladesh and the Netherlands are densely populated, low-lying countries at serious risk of flooding. However, the population of the Netherlands, living in a country far more wealthy and capable to invest in adaptation measures, is much less likely to suffer the consequences of flooding than the population of Bangladesh.

> Agricultural production in many African countries and regions will likely be severely compromised by climate change and climate variability. This would adversely affect food security and exacerbate malnutrition (very high confidence).[134]

The fifth and latest IPCC assessment report contains a chapter on agriculture in the volume about adaptation.[135] This chapter of the IPCC report reflects an emphasis on the impacts of climate change on crop yields, notably through a number of figures that show these projected impacts. Figure 7.1 illustrates a 'summary of estimates of the impact of recent climate trends on yields for four major crops';[136] Figure 7.5 illustrates a 'summary of projected changes in crop yields, due to climate change over the 21st century';[137] Figure 7.7 illustrates a 'boxplot summary of studies that quantify impact of climate and CO2 changes on crop yields, including historical and projected impacts, mean and variability of yields, and for all available crops in temperate and tropical regions';[138] and Box 7.1 illustrates the 'projected impacts for crops and livestock in global regions and sub-regions under future scenarios'.[139]

Declining crop yields are believed also to have an effect on food prices,[140] with increasing prices negatively impacting access to food and food security. The consequences of climate change on agriculture, in terms of crop yields (production/availability) and prices (access), have led to climate change being linked explicitly to food insecurity and hunger. A 2009 report by the United Nations World Food Programme projects that climate change 'will tend to reduce global agricultural production, increase food prices and intensify the risk of hunger and malnutrition'.[141] This same report suggests that the percentage of the world population at risk of hunger will increase from 10 to 20 per cent by 2050, '*as a result of* climate change'.[142] The report also confirms

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134 Intergovernmental Panel on Climate Change, *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. M.L. Parry et al. (Cambridge, UK: Cambridge University Press, 2007), 48.

135 John R. Porter et al., 'Food Security and Food Production Systems' in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, UK and New York, NY, USA: Cambridge University Press, 2013).

136 Ibid., 492: Figure 7.2: 'Summary of estimates of the impact of recent climate trends on yields for four major crops.'

137 Ibid., 504: Figure 7.5: 'Summary of projected changes in crop yields, due to climate change over the 21st century.'

138 Ibid., 506: Figure 7.7: 'Boxplot summary of studies that quantify impact of climate and CO2 changes on crop yields, including historical and projected impacts, mean and variability of yields, and for all available crops in temperate and tropical regions.'

139 Ibid., 509-512: Box 7.1: 'Projected Impacts for Crops and Livestock in Global Regions and Sub-Regions under Future Scenarios'.

140 Ibid., 494: 'fluctuations and trends in food production are also widely believed to have played a role in recent price changes, with recent price spikes often following climate extremes in major producers (Figure 7-3).'

141 Martin Parry et al., 'Climate Change and Hunger: Responding to the Challenge' (World Food Programme, 2009), 14.

142 Ibid., 4. Emphasis added.

that the impacts on food production and food security will be most severe in Sub-Saharan Africa and South Asia.[143] A 2010 report by the International Food Policy Research Institute (IFPRI) links the need to adapt to the impact of climate change to the goal of eradicating extreme poverty and hunger.[144] The report emphasises the growing world population, to an estimated 9 billion in 2050, leading to growing demand on food resources, and climate change 'adds further pressure' on the need to increase sustainable food production.[145] The bottom line is that 'farmers everywhere will need to adapt to climate change'.[146]

Liz Young in her book *World Hunger* has referred to climatic variables as 'the proximate cause of famine'.[147] 'Proximate' seems to be a tentative way of stating that climatic variables do have a very significant effect on hunger, but cannot be considered its sole cause. Whatever the precise relationship between climate change and hunger, historical accounts indicate that the ability to adapt to the climate – for example by reducing crop vulnerability – is crucial in eliminating or preventing hunger.[148] Bryson and Murray concluded in their book that climate has changed throughout human history as it is a natural phenomenon, and the only way to deal with it is to adapt and accept the limitations that the earth 'places on our numbers and our actions'.[149] Current climate change adds a new dimension to the relationship between climate and hunger because of the high likeliness that climate change is not an entirely natural phenomenon, and moreover is developing much more rapidly than previous instances of climatic changes. There is an urgency, therefore, to find effective ways to adapt to the impacts of climate change on agriculture, and on hunger.

3.2 CLIMATE-READY SEEDS AS A CLIMATE CHANGE ADAPTATION STRATEGY

Modern biotechnologies have been applied to agriculture, primarily with the aim of increasing food production. During a period in the 1970s and 1980s known as the Green Revolution, many small agricultural practices were replaced by large industrial farming techniques, and crop yields – especially in Latin America and parts of Asia – increased significantly due to the employment of

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143 Ibid., 12.
144 Gerard C. Nelson et al., 'Food Security, Farming, and Climate Change to 2050: Scenarios, Results, Policy Options' (Washington D.C.: International Food Policy Research Institute, 2010), Introduction, 1.
145 Ibid., 2.
146 Ibid.
147 Young, note 29 above, 115.
148 See, for example: Crossgrove et al., note 35 above, 235. Quoting Andrew Appleby in a piece on famines in the Little Ice Age, the authors note that 'the crucial variable in the elimination of famine was not the weather but the ability to adapt to the weather'. Andrew B. Appleby, 'Epidemics and Famine in the Little Ice Age' in *Climate and History*, ed. Robert I. Rotberg and Theodore K Rabb (Princeton: Princeton University Press, 1981), 83.
149 Bryson and Murray, note 124 above, 156.

new agricultural biotechnologies.[150] The Green Revolution has been hailed for drastically increasing food production and realizing food security for many people, but it has also been criticized for focusing too much on production and not on distribution, of income and of food.[151] After the Green Revolution, new forms of biotechnology continue to be developed in efforts to increase food production and improve food quality.

Genetic engineering is a form of biotechnology and allows for the modification of specific genes in a seed, by extracting isolated genes from one seed and inserting them into another. This form of biotechnology enables more precise and quicker modifications in crop traits than conventional agricultural breeding methods. The first genetically engineered crop allowed for commercialization was a tomato called 'Flavr Savr', made to ripen more slowly and retain colour and flavour for longer.[152] Besides attempts to keep tomatoes fresh for longer, in the early era of agricultural biotechnologies, scientists focused attention on genetically engineering crops for pesticide and herbicide resistance.[153] Seed corporations developing these herbicide- and pesticide resistant seeds intend to kill weeds and other unwanted plants and pests using pesticides and herbicides, without killing the crop itself. Monsanto's 'RoundUp Ready Crops' were first developed in 1996; with RoundUp being the herbicide.[154] In applying genetic engineering to develop herbicide resistance, such as the example of RoundUp Ready, both the herbicide and the resistant crop are developed by the same company.[155]

Using biotechnology and genetic engineering techniques to increase crop yields and improve the quality of crops is therefore not a new phenomenon. Genetic engineering has in recent years come to be used to develop seeds and crops that are resilient to certain climatic conditions – such as drought, higher average temperatures, and increased precipitation – that are predicted to occur with climate change. 'Engineering seeds to make them cope better with altered climates'[156] is sometimes presented as a possible adaptation strategy to climate change. The ETC Group, a civil society organization, has referred to these seeds as 'climate-ready

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[150] Oosterveer and Sonnenfeld, note 22 above, 48.

[151] See, for example: International Food Policy Research Institute, 'Green Revolution: Cure or Blessing' (Washington, D.C.: International Food Policy Research Institute, 2002); Keith B. Griffin, *The Political Economy of Agrarian Change: An Essay on the Green Revolution*, 2nd ed. (London: Macmillan, 1979), xi: 'the new technology has not revolutionized production but it has often helped to worsen the distribution of income'.

[152] G. Bruening and J.M. Lyons, 'The Case of the Flavr Savr Tomato' *California Agriculture* 54 (July-August 2000), http://ucanr.org/repository/cao/landingpage.cfm?article=ca.v054n04p6&fulltext=yes, last accessed on 22 July 2015.

[153] GMO Compass, 'Herbicide Resistant Crops', http://www.gmo-compass.org/eng/agri_biotechnology/breeding_aims/146.herbicide_resistant_crops.html, last accessed on 22 July 2015.

[154] Maggie Delano, 'Roundup Ready Crops: Cash Crop or Third World Savior?' MIT Spring 2009, http://web.mit.edu/demoscience/Monsanto/about.html, last accessed on 22 July 2015.

[155] Ibid.

[156] W. Neil Adger et al., *Fairness in Adaptation to Climate Change* (Cambridge, MA: MIT Press, 2006), 46.

seeds'.[157] Large seed corporations are now turning their attention to research and development of climate-ready seeds.[158] They have fixated their interest especially on drought-resistance. In 2008, the then global vice-president for research and development at Pioneer said that '[d]rought is a global problem and we recognize the threat that comes with climate change. We've got our top talent in our organization working on this'.[159] A spokesperson for Monsanto has also indicated that drought-tolerance is a key area of their research.[160] One variety of genetically engineered drought-resistant maize, developed by Monsanto, was the first to be allowed for commercialization on the US market in December 2011.[161]

The surge in patent applications on climate-resilient traits in recent years illustrates the expansion of research and development of climate-ready seeds.[162] The ETC Group in a report from 2008[163] has illustrated this clearly, in the following table, showing the stress-resistant traits for which biotechnology corporations apply for patent rights.

[157] See, for instance: ETC Group, 'Capturing "Climate Genes": Gene Giants Stockpile Patents on "Climate-Ready" Crops in Bid to Become "Biomassters"' (ETC Group, 2010).
[158] Some of the biggest agricultural biotechnology corporations are Monsanto, Syngenta, DuPont/Pioneer Hi Bred, BASF, and Bayer.
[159] Carey Gillam, 'Biotech Companies Race for Drought-Tolerant Crops' *Thomson Reuters*, 2008, http://uk.reuters.com/article/2008/01/14/lifestyle-seeds-drought-dc-idUKN1149367520080114, last accessed on 22 July 2015.
[160] Ibid. See also: Jack Kaskey and Antonio Ligi, 'The Seed Makers Who Don't Pray for Rain – Agricultural Companies Tweak Crops to Flourish with Less' *Businessweek*, 29 April 2010, http://www.businessweek.com/magazine/content/10_19/b4177019139642.htm, last accessed on 22 July 2015: '[F]armers around the world are going to pay hundreds of millions of dollars for seeds that require less water'.
[161] See: International Service for the Acquisition of Agri-biotech Applications, 'ISAAA GM Approval Database: Mon87460', http://www.isaaa.org/gmapprovaldatabase/event/default.asp?EventID=98, last accessed on 22 July 2015. See also: Michael Eisenstein, 'Plant Breeding: Discovery in a Dry Spell' *Nature* 501, no. S7-S9 (2013).
[162] Shardul Agrawala et al., 'Adaptation and Innovation: An Analysis of Crop Biotechnology Patent Data' *OECD Environment Working Papers No. 40* (OECD, 2012).
[163] ETC Group, 'Patenting the "Climate Genes" … and Capturing the Climate Agenda' (ETC Group, 2008).

Table 1: Who Controls "Climate-Ready" Genes and Traits?[164]

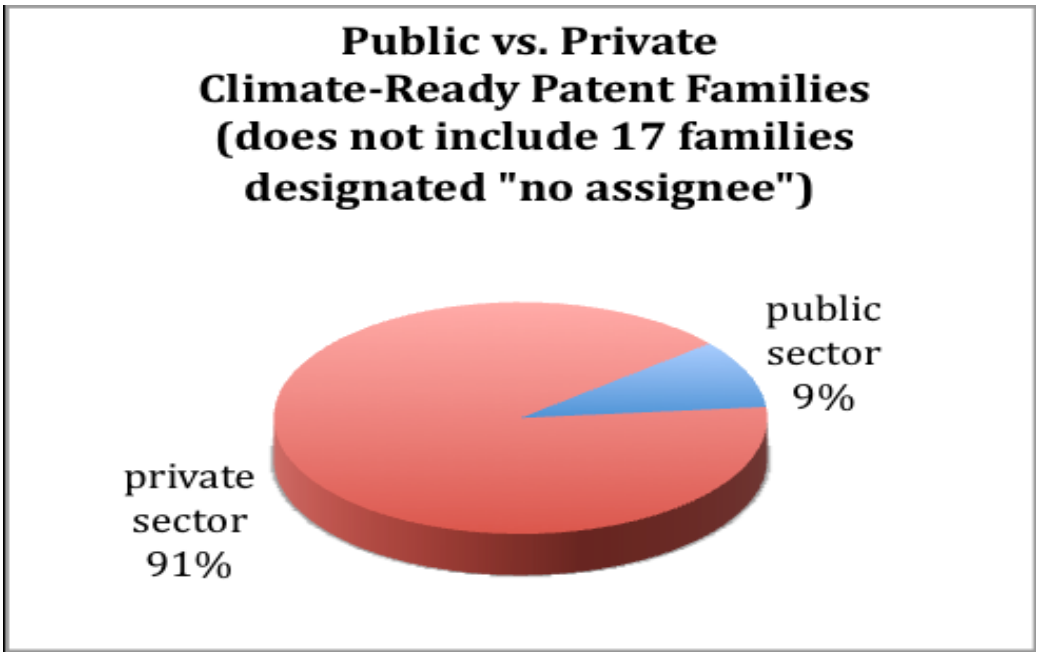
Company	No. of Patents or Patent Applications	Abiotic Stress Traits Cited in Patent(s)	Patent Jurisdictions Where Applied for or Granted
BASF (Germany)	21	Drought; salinity; environmental stress; cold; heat	U.S., EPO, WIPO, Argentina, Austria, Australia, Canada, China, Germany, Norway, Spain
Bayer (Germany)	5	Stress resistance; environmental stress; drought; temperature, water or chemical load; abiotic stress.	U.S., EPO, WIPO, Argentina, Australia, Canada, China, Germany, Korea,
Ceres, Inc. (USA - partners with Monsanto)	4	Drought; cold; abiotic stress; flood; salinity.	U.S., EPO, WIPO, Australia, Brazil, Canada, China
Dow (USA)	2	Drought; heat	U.S.
DuPont (Pioneer Hi-Bred – USA)	1	Drought; cold; abiotic stress.	U.S., WIPO, Argentina
Evogene Ltd. (Israel - partners with Monsanto and Dupont)	2	Abiotic stress; salinity; drought; heat; cold; UV irradiation	U.S., EPO, WIPO, Brazil, Canada, China, Mexico, Russian Federation
Mendel Biotechnology, Inc. (USA - Monsanto holds equity stake)	3	Drought; abiotic stress.	U.S., EPO, WIPO, Australia, Brazil, Canada, China, Japan, Mexico
Monsanto (USA)	6	Drought; abiotic stress; nitrogen use efficiency; cold.	U.S., EPO, WIPO, Argentina, Australia, Brazil, Canada, China, Germany, Japan, Korea, Mexico, South Africa
Syngenta (Switzerland)	7	Drought; abiotic stress; cold; salinity.	U.S., EPO, WIPO, Australia, Brazil, Canada, China

[164] Ibid., 4.

Figures by the Organization for Economic Cooperation and Development (OECD) highlight that patent applications on adaptation-related biotechnology have increased from less than ten in 1997 to almost 200 in 2007.[165] The OECD report 'provides the first empirical quantification of innovation in biotechnology to develop crops that are more resilient to three forms of abiotic stress associated with climate change: drought, soil salinity and temperature extremes'.[166]

Figures presented by the ETC Group and the OECD show not only that patent applications on climate-ready seeds are increasing, but also that by far most of these patent applications are made by private sector seed corporations. In a 2008 communication, the ETC Group stated that large seed corporations had filed 532 patent applications on 'climate-ready' genes at patent offices around the world.[167] A later ETC Group report from 2010 notes that a further 1663 patent documents for abiotic stress tolerance in plants were filed between 2008 and 2010.[168] Private sector dominance is shown in this chart that was included in a report by the ETC Group:

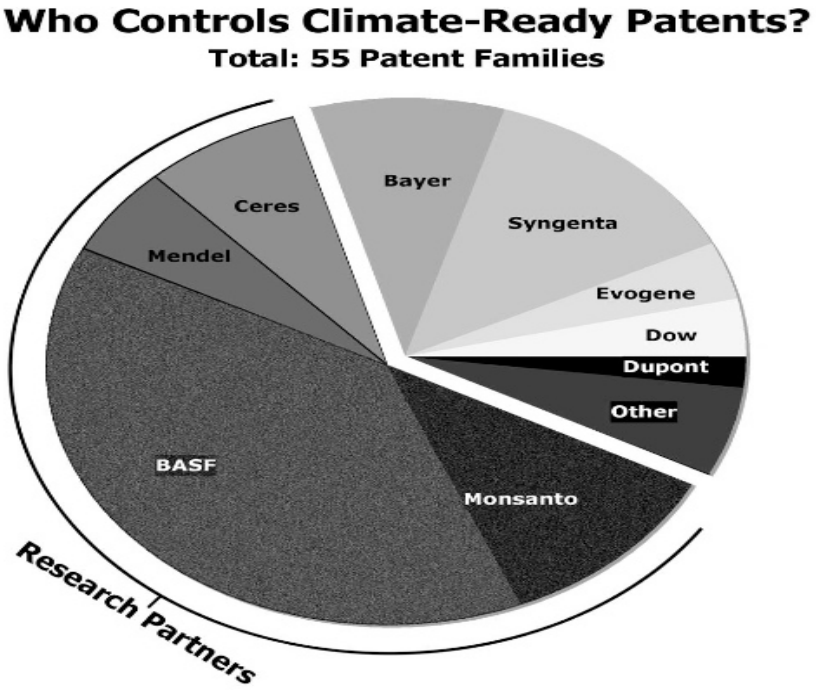
Figure 1: Public vs. Private Climate-Ready Patent Families[169]



[165] Agrawala et al. 2012, note 162 above, 3. As the report notes on page 9: 'Patents are a useful indicator of innovation in agricultural biotechnology as they illustrate the evolution of inventive activity in adaptation-related biotechnology over time, the countries where innovation takes place, where patent applications are submitted and the institutions involved.'
[166] Ibid., 9.
[167] ETC Group 2008, note 163 above. A list of these patent applications can be found in Appendix A of the report.
[168] ETC Group 2010, note 157 above, 1.
[169] ETC Group 2010, note 157 above, 6.

A chart included in an earlier report by the ETC Group shows that there are, moreover, only a small group of private sector corporations that dominate the patenting of climate-ready seeds:

Figure 2: Who Controls Climate-Ready Patents? [170]



These figures are confirmed also by the OECD. The OECD reports that out of the five most active patenting organizations, four come from the private sector, and these four private sector organizations at the time of the study accounted for 23 per cent of all adaptation-related patent applications.[171]

There is growing attention for the development of climate-ready seeds. The main interest in this research is not to examine climate-ready seeds as an adaptation strategy, but especially to investigate how international law is invoked to promote or critique them as a possible solution to climate-induced hunger. Before being able to do that, the following section will outline a number of perspectives on climate-ready seeds, that either view them as a means to address climate-induced hunger, or not.

3.3 NARRATIVES OF CLIMATE-READY SEEDS

[170] ETC Group 2008, note 163 above, 5.
[171] Agrawala et al. 2012, note 162 above, 3.

Contradictory accounts of climate-ready seeds will be presented as 'narratives'. The narratives centre on the question whether these biotechnologies can contribute to combating hunger in the face of climate change. Some of the main narratives will be outlined here. The intention is not to choose a 'best' or 'correct' narrative, or to supply a complete overview of all possible narratives. It is, rather, to highlight some of the various and contradictory ways in which this potential adaptation strategy is perceived with regard to global hunger.

The narratives presented are as follows: a) those that contend that climate-ready seeds will combat hunger in the context of climate change; b) those that contend that climate-ready seeds will not combat hunger in the context of climate change; and c) those that contend that climate-ready seeds might be able to combat hunger in the context of climate change.

3.3.1 Climate-Ready Seeds will Combat Hunger in the Context of Climate Change

The main gist of this first narrative is that climate-ready seeds will serve to increase crop yields despite the adverse climatic conditions, and will thereby contribute to combating hunger in the face of climate change. Actors who promote climate-ready seeds, most notably seed corporations, make extensive use of rhetoric that presents this adaptation strategy as primarily aimed at alleviating hunger. In addition to biotechnology corporations developing these seeds, a range of participants in the discourse on climate-ready seeds contribute to this narrative, including governmental and non-governmental actors providing views on this issue, and academic opinions. A number of these materials will be outlined here to illustrate this first narrative. This section will first briefly outline how agricultural biotechnologies have come to be included in discourse on hunger. Subsequently, the promotion of climate-ready crops will be explained.

Agricultural biotech corporations are the biggest players in researching, developing, promoting, and patenting genetic traits that are classified as 'climate-resilient'.[172] The assertion that biotechnological innovations in agriculture can improve crops and help alleviate hunger is not new. The first widely-publicized biotech crop that was promoted as a solution to hunger was Golden Rice, a variety of rice genetically engineered to contain Vitamin A, which was first

[172] In a 2010 report by the ETC Group, it was estimated that the large agricultural biotechnology corporations – including Monsanto, Syngenta, BASF, DuPont, and Bayer – have filed over 500 patent applications on 'climate-ready' genes. Private sector patent applications are as high as 90%, as opposed to less than 10% of public sector patent applications on climate-ready genes. ETC Group 2010, note 157 above. See also: note 169 above.

unveiled by two Swiss and German scientists in 1999.[173] This engineered variety proposed to eradicate Vitamin A deficiency in certain countries.[174] Despite criticisms,[175] the launch of Golden Rice opened the way for presenting agricultural biotechnology as a tool in the fight against malnutrition and hunger. Monsanto soon after launched an extensive advertising campaign, its main message being that applying biotechnology to improve foods could help end world hunger. One specific advertisement read: 'Biotechnology is one of tomorrow's tools in our hands today. Slowing its acceptance is a luxury our hungry world cannot afford.'[176]

Biotechnology corporations are paying attention to issues related to climate change. A press release by Monsanto from 2013 reads:

> There's no way around it; climate change is worse than previously projected, and it will have a dramatic effect on agriculture if we don't do all we can to find innovative solutions in breeding, irrigation and technology. We believe our people are well positioned to make a meaningful contribution.[177]

Bayer has referred to climate change as 'one of the great global challenges'[178] and writes that:

> Our objective is to develop innovative solutions that will help address global challenges such as … feeding a steadily growing world population, combating climate change and overcoming the scarcity of natural resources.[179]

Against this backdrop, the spotlight has been turned on climate-ready seeds as a solution to hunger.[180] Monsanto has been working specifically on the development of drought-tolerant

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[173] Goldenrice.org, 'History of the Golden Rice Project', http://www.goldenrice.org/Content1-Who/who2_history.php., last accessed on 22 July 2015.
[174] Ibid.
[175] See, for example: Biothai (Thailand) et al., 'Grains of Delusion: Golden Rice Seen from the Ground', GRAIN, 25 February 2001, http://www.grain.org/article/entries/10-grains-of-delusion-golden-rice-seen-from-the-ground, last accessed on 22 July 2015.
[176] John Robbins, 'Can GMOs Help End World Hunger?' *Huffington Post*, 8 January 2011, http://www.huffingtonpost.com/john-robbins/gmo-food_b_914968.html, last accessed on 22 July 2015.
[177] Monsanto, 'Climate Change and the Impact on Food Security' 2013, http://sustainability.monsanto.com/environment/climate-change-and-the-impact-on-food-security, last accessed on 22 July 2015.
[178] Bayer, 'Annual Report 2009', http://www.bayer.com/en/gb-2009-en.pdfx, 114, last accessed on 22 July 2015.
[179] Ibid., 109.
[180] For a comprehensive overview of how climate-ready seeds are promoted by seed corporations, see: Matthew Rimmer, 'Climate-Ready Crops: Intellectual Property, Climate Change and Agriculture' in *Intellectual Property and Emerging Technologies: The New Biology*, 333-347, ed. Matthew Rimmer and Alison McLennan (Cheltenham, UK; Northampton, MA, USA: Edward Elgar 2012), especially at 'Part II Patent Law and Agricultural Biotechnology', 333-347.

maize in Africa. Working in collaboration with an international agricultural research centre called Water Efficient Maize for Africa (WEMA), Monsanto contends that it will provide seeds and technology necessary to develop water efficient – or 'drought-tolerant' – maize.[181] In a policy brief concerning this project, WEMA states that 'drought' leads to 'crop failure, hunger, and poverty'.[182] Although they do not expressly say that drought-tolerant maize will contribute to alleviating hunger, this is implicit in the discourse. Monsanto and WEMA identify drought as a cause of hunger and promote a drought-tolerant crop in this context. Bayer's 2014 annual report states that the company is 'targeting the development of plants that have high tolerance to external stress factors, such as drought, and can more efficiently utilize water'[183] and that 'plant biotechnology can help to improve crop yields, yield security and the stress tolerance of plants'.[184]

Syngenta's website, for some time, showed the following text upon entering: 'There will be 9 billion people on our planet by 2050. Farmland is limited. How do we feed a growing world population?'[185] Although not mentioning any specific solution, this type of rhetoric further frames agricultural biotechnology corporations as valuable players in the search for solutions to the problem of hunger, finding ways to 'feed a growing world population'.

The presentation of climate-ready seeds above illustrates that a handful of private sector seed corporations are the dominant players in applying for patent rights on climate-ready seeds and crops. Patent applications are good indicators of investments made in new innovations;[186] and it can therefore be said that seed corporations have a clear interest in developing climate-ready crops. The way in which these corporations present drought as an adverse climatic condition impacting on 'hunger', and advertising the biotechnologies they develop as means to 'feed the world', suggests that they promote agricultural biotechnologies – including climate-resilient crops – as a means to combat hunger.

Seed corporations are the main actors in this narrative, but they are not the only ones telling this story. Media references regularly adopt the rhetoric promoted by seed corporations and associate climate-resilient biotechnologies with fighting hunger. An article that appeared in *The Economist* in 2006 focused on efforts to increase yields of rice in adverse climatic conditions

[181] African Agricultural Technology Foundation, 'Water Efficient Maize for Africa (WEMA)', http://www.aatf-africa.org/projects-programmes/projects/wema, last accessed on 22 July 2015.
[182] Ibid.
[183] Bayer, 'Annual Report 2014', http://www.annualreport2014.bayer.com/, 74, last accessed on 22 July 2015.
[184] Ibid., 116.
[185] Syngenta, www.syngenta.com, last accessed on 22 July 2015.
[186] See: Agrawala et al 2012, at note 165 above.

using genetic modification by the International Rice Research Institute (IRRI).[187] This article iterates the predicted increase in droughts as a result of climate change, and the adverse effects it will have on rice yields in Asia.[188] Scientists from the IRRI voice doubts that conventional breeding alone will be enough to sustain rice yields, and advocate the use of genetic engineering.[189] Although the term 'hunger' is not mentioned, the title of the article is 'Genetic Modification Filling Tomorrow's Rice Bowl'. This clearly seems to imply that genetically engineered crops can contribute to alleviating hunger. Other news sources explicitly mention hunger. An article in the Dutch newspaper *De Volkskrant* was published in 2006 under the title 'New Crops Needed Against Hunger as a Result of Warmer Climate'.[190] This article is based on a press release by the Consultative Group on International Agricultural Research (CGIAR), a large conglomerate of international agricultural research institutes.[191] The article suggests that new crop varieties can resist weeks of flooding and extreme droughts. Politicians also sometimes provide their views on genetically modified foods. For instance, *The Guardian* reported the UK's former Secretary of State for Environment, Food and Rural Affairs, Owen Paterson, arguing that it would be 'immoral' not to use genetically modified crops in the fight to end global hunger.[192]

Voices from academia and policy have also pointed at the value of biotechnology and genetic engineering in combating hunger. Robert Paarlberg makes a strong case for agricultural biotechnology in the fight against hunger, particularly in his book *Starved for Science*, in which he promotes the use of agricultural biotechnology in Africa. He argues that '[t]he science of genetic engineering has significant potential to help rural Africa, particularly since it can now speed the development of crop varieties better able to tolerate stress factors such as drought'.[193] This explicit mention of 'drought-tolerant' crops endorses the potential value of climate-ready seeds. Paul Collier also writes in support of the use of biotechnology in adapting to climate change and combating hunger. Focusing on African agriculture and its need to adapt to climate change,

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[187] The Economist, 'Genetic Modification Filling Tomorrow's Rice Bowl: Genetic Engineers Are Applying Their Skills to Tropical Crops' *The Economist*, 6 December 2006, http://www.economist.com/node/8380318, last accessed on 22 July 2015.

[188] Ibid.: '… global warming is likely to make farmers' lives increasingly difficult, by causing more frequent droughts in some places and worse flooding in others.'

[189] Ibid.: 'Scientists at the International Rice Research Institute (IRRI) doubt it is possible to improve productivity as much as is needed through better farming practices or the adoption of new strains derived from conventional cross-breeding. Instead, they aim to improve rice yields by 50% using modern genetic techniques.'

[190] De Volkskrant, 'Nieuwe Gewassen Nodig Tegen Honger Door Warmer Klimaat' *De Volkskrant*, 4 December 2006. Title translated to English.

[191] More information about the CGIAR and this particular press release can be found in section 3.3.3, especially at note 219 below.

[192] John Vidal, 'UK Should Provide GM Crop Technology to Poor Countries, Says Owen Paterson' *The Guardian*, 20 June 2013, http://www.theguardian.com/environment/2013/jun/20/gm-crops-food-crisis-owen-paterson?guni=Article:in%20body%20link, last accessed on 22 July 2015.

[193] Robert L. Paarlberg, *Starved for Science: How Biotechnology Is Being Kept out of Africa* (Cambridge, MA: Harvard University Press, 2008), viii.

Collier recognizes that genetic modification is not a 'magic fix'.[194] Nevertheless, he emphasizes that without genetic modification, 'the task of keeping Africa's food production abreast of its population growth looks daunting'.[195] Stephen Jones has written that agricultural biotechnology, in the form of genetic engineering, is considered not only as the "'next big thing," but for many, "the only thing" to improve agriculture and to end food-based misery in developing countries'.[196]

The storyline here is that genetically engineered seeds and crops are necessary tools to ensure adequate food production in order to address problems of food insecurity and hunger. Large seed corporations represent this narrative most clearly, both implicitly through the rising number of patent applications for climate-resilient traits in seeds and crops, and explicitly by advertising genetically engineered seeds as tools to fight hunger. This story is complemented by other voices that also promote genetically engineered seeds and crops as necessary tools in the fight against hunger. The promotion of climate-ready seeds as tools to address hunger and food insecurity draws on an understanding of hunger as a problem of availability of food: climate change leads to reduced crop yields, climate-ready crops can maintain or increase crop yields, and thereby alleviate hunger. The portrayals of different perceptions of hunger earlier in this chapter show that the availability of food is not the only factor contributing to food insecurity and hunger. The next narrative that will be outline highlights access to food as the primary factor contributing to hunger.

3.3.2 Climate-Ready Seeds will not Combat Hunger in the Context of Climate Change

While agricultural biotechnology corporations endorse climate-ready seeds as strategies in the fight against hunger, there are also many voices that do not believe that these seeds will deliver on that promise. This second narrative is grounded on a number of arguments, including that climate-ready seeds are not (yet) capable of increasing crop yields; that increasing food production in itself will not eradicate hunger; and that extensive and exclusive patent applications filed by private corporations on climate-ready seeds deny most people's access to those seeds, and moreover concentrate mainly on commercially viable crops. This section will set out these contentions.

The previous narrative is based on the premise that climate-ready seeds produce higher crop yields under abiotic stresses than conventional seeds. However, several prominent scientists

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[194] Paul Collier, 'The Politics of Hunger' *Foreign Affairs* 87 (2008), 76: 'It is important to recognize that genetic modification, like commercialization, is not a magic fix for African agriculture: there is no such fix.'
[195] Ibid., 76.
[196] Stephen S. Jones, 'Progress without Patents: Public Maintenance of Agricultural Knowledge' *Journal of Environmental Law and Litigation* 19 (2004), 470.

refute this. The Union of Concerned Scientists (UCS)[197] revealed, in a report from 2009, that genetically modified seeds had had, at least until then, hardly any success in terms of higher yields than conventionally bred seeds.[198] According to the research cited in the report, most of the recent increases in crop yields had been the result of successes in traditional breeding methods, rather than genetically modified crops.[199] In a more recent report from 2012, the UCS is critical of drought-resistant crops in particular. In this report, the scientists highlight the lack of success in 'improved water use efficiency' of genetically engineered maize varieties to date.[200] Moreover, they argue that the limited results are not worth the costs of developing drought-resistant crop traits.[201] Monsanto has developed the only genetically engineered variety of maize allowed for commercialization in the US so far.[202] However, test results by Monsanto itself indicated that there is little evidence that this variety is more drought-resistant than conventionally bred crops.[203]

Engineering seeds for resistance to abiotic stresses is much more complex than engineering seeds for resistance to herbicides and pesticides. Considering that the course and impacts of climate change are uncertain and the exact conditions cannot be predicted, it will prove very difficult – if not impossible – to engineer traits that are truly resistant to abiotic stresses.[204] If, as these scientists argue, the leading genetically engineered climate-ready trait, in the form of drought-resistance, does not increase food production in practice, then how can these seeds be decisive in the fight against hunger?

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[197] The UCS is an independent collaboration of scientists based in the US that critically addresses 'the planet's most pressing problems'. For more information, see: www.ucsusa.org, last accessed on 22 July 2015.

[198] Doug Gurian-Sherman, 'Failure to Yield: Evaluating the Performance of Genetically Engineered Crops' (Cambridge, MA: Union of Concerned Scientists, 2009).

[199] Ibid.

[200] Doug Gurian-Sherman, 'High and Dry: Why Genetic Engineering Is Not Solving Agriculture's Drought Problem in a Thirsty World' (Cambridge, MA: Union of Concerned Scientists, June 2012).

[201] Ibid.

[202] ISAAA, note 161 above.

[203] The Animal and Plant Health Inspection Service of the United States Department of Agriculture in their final assessment report of this maize variety and based on Monsanto's own field test results, wrote that 'equally drought resistant corn varieties produced through conventional breeding techniques are readily available and may be cultivated in lieu of MON87460'. United States Department of Agriculture – Animal and Plant Health Inspection Service, 'Monsanto Company Petition (07-Cr-191u) for Determination of Non-Regulated Status of Event Mon 87460 – Final Environmental Assessment' (Washington, D.C.: USDA, November 2011), http://www.aphis.usda.gov/brs/aphisdocs/09_05501p_fea.pdf, last accessed on 22 July 2015.

[204] Gurian-Sherman 2012, note 200 above, 3-4: 'In contrast to other GE crops now on the market, such as insect-resistant and herbicide-tolerant crops, drought tolerance requires the interaction of many genes. And genetic engineering can manipulate only a few genes at a time. Some individual genes can affect genetically complex traits such as drought tolerance. However, even if genetic engineering can improve the drought tolerance of crops somewhat, it may not be enough to substantially reduce crop losses in the real world, where drought can vary in severity and duration. Any given engineered gene is likely to address only some types of drought, and then only to a limited extent.'

Even if climate-ready seeds can successfully increase food production, there is still substantial debate on whether increasing production is the key to solving hunger. Sen's perception of hunger, as illustrated earlier, directs attention towards persons being able to *access* enough food. Frances Moore Lappé and Joseph Collins, who actively support the view that hunger is caused by lack of access to food, have written that 'hunger exists in the face of abundance',[205] and furthermore that 'the narrow focus on productivity has actually compounded the problem of hunger'.[206] Advocating the need to increase crop yields in the context of a changing climate rather than considering problems of access and distribution, shifts attention away from alternative – and perhaps more effective – ways to address hunger. Even if genetically engineered, climate-resilient crops were to be developed successfully, and indeed would bring higher crop yields, this is still not a guarantee that those who suffer the most from hunger in the face of climate change will reap the benefits. Onora O'Neill, in an article on ending world hunger, has written that '[t]echnological innovation, even if successful, may not benefit those who need it most'.[207] The reason for this is that poorer (and hungrier) farmers and consumers cannot afford the expensive innovations, and therefore do not benefit from them.

The ETC Group is one of the most vocal critics of climate-ready seeds and the corporate patents applied to these seeds. Its reports state that, through the application of patent rights, climate-ready seeds have come in the hands of a few powerful agricultural biotechnology corporations.[208] These corporations subsequently promote genetically engineered seeds as a 'silver bullet' solution to climate change.[209] The ETC Group cites Vandana Shiva, Director of India's Research Foundation for Science, Technology, and Ecology and founder of Navdanya,[210] a prominent critical network of seed keepers, who has said that:

> These patents are the latest form of biopiracy … Farmers have bred seeds for drought, flood and salt tolerance over millennia. Climate resilience ultimately depends on farmers' innovation, biodiversity and agro-ecological processes staying in the hands of farming communities.[211]

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[205] Frances Moore Lappé and Joseph Collins, *Food First* (London: Abacus, 1982), 21.
[206] Ibid., 99. See also in this regard: Susan George, *How the Other Half Dies: The Real Reasons for World Hunger*, A Pelican Original (Harmondsworth: Penguin, 1976) and Susan George, *Les Stratèges De La Faim* (Geneva: Grounauer, 1981).
[207] Onora O'Neill, 'Ending World Hunger' in *World Hunger and Morality*, ed. William Aiken and Hugh LaFollette (Upper Saddle River, New Jersey: Prentice Hall, 1996), 92.
[208] ETC Group 2010, note 157 above, 2.
[209] Ibid., 1.
[210] Navdanya, http://www.navdanya.org/, last accessed on 22 July 2015.
[211] ETC Group, 'Surge in Corporate Patents on "Climate-Ready" Crops Threaten Biodiversity and Signal Grab on Land and Biomass' 25 October 2010,

Seed corporations developing climate-resilient traits in seeds and applying for patent rights on these traits concentrate on marketable crops, such as maize, that are used most in the developed world. These corporations do not concentrate on improving those crops that are used more in developing countries, which may additionally have more natural resistance to droughts and other climatic conditions.[212] London-based International Institute for Environment and Development (IIED) maintains that 'farmers in developing countries are losing one of their best hopes to limit the impacts of climate change because of growing corporate control of the seeds they plant'.[213] The IIED argues that because of the application of patent rights to processes and innovations related to climate-ready seeds and the costs attached to using this knowledge, farmers in developing countries – who are arguably most in need of climate-ready seeds – are not able to obtain and use them. The growing number of patent applications on these seeds by large corporations does not mesh well with the aim to combat hunger in the face of climate change.[214]

Seed corporations that research, develop, and patent climate-ready seeds embrace commercial profitability as their primary objective, and not solving the problem of world hunger. As Henry Shue writes, '[i]f there were lots of profit to be made in solving the world's hunger problem, market forces would presumably have sent people rushing in to solve it long ago'.[215] This does not mean that private actors can contribute nothing to problems of food insecurity and hunger; the point is simply that this is not their primary goal. La Via Campesina has stated that:

> Monsanto and other agribusiness corporations … claim that GM crops are a solution to hunger … and the effects of climate change including drought and flooding – even though trials have repeatedly failed. Analysis has shown that there is no evidence that GM crops produce greater yields than conventional crops, and there are no 'miracle' crops available that tolerate drought, flooding or salt. … What has happened though,

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http://www.etcgroup.org/sites/www.etcgroup.org/files/publication/pdf_file/ETC_ClimatereadyNR251010final.pdf, last accessed on 22 July 2015.

[212] See, for example: Miguel A. Altieri, 'Agroecology, Small Farms, and Food Sovereignty' *Monthly Review* 61 (2009), in which the author argues that traditional crops grown by indigenous farmers often outweigh corporate monocrops in terms of productivity and resilience to adverse climatic conditions.

[213] International Institute for Environment and Development, 'Seed Industry Ignores Farmers' Rights to Adapt to Climate Change' IIED, 7 September 2009, http://www.iied.org/seed-industry-ignores-farmers-rights-adapt-climate-change, last accessed on 22 July 2015.

[214] See, for example: Jack Ralph Kloppenburg, *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000*, 2nd ed., Science and Technology in Society (Madison, Wis.: University of Wisconsin Press, 2004), 354: '[G]iven the many uncertainties associated with global warming and the cumulative and unanticipated effects of human action on the biosphere, it is irresponsible to commit the future to a single path defined by profitability'. Keith Aoki, *Seed Wars: Controversies and Cases on Plant Genetic Resources and Intellectual Property* (Durham, N.C.: Carolina Academic Press, 2008).

[215] Henry Shue, 'Solidarity among Strangers and the Right to Food' in *World Hunger and Morality*, ed. William Aiken and Hugh LaFollette (Upper Saddle River, New Jersey: Prentice Hall, 1996), 128.

> rather than solving hunger, is that the corporate grip on agriculture has tightened as we head towards one billion people going hungry globally.[216]

Three fundamental arguments therefore underlie the broad narrative that climate-ready seeds contribute nothing to combating hunger in practice: that more food production is not necessary to combat hunger; that even if more food production would be necessary to combat hunger, these seeds have not been proven to produce more crop yields; and finally, even if such proof will emerge in the future, the increased crop yields will not combat hunger in the face of climate change, partly because the exclusive patent applications on them further curtail access by those most likely to need them.

The first two narratives presented view the issues from opposing ends of the spectrum, respectively positively and negatively associating climate-ready seeds with the effort to combat hunger. The next and final narrative to be discussed may be qualified as an intermediate narrative, which holds that climate-ready seeds *might* contribute to combating hunger in the context of climate change.

3.3.3 Climate-Ready Seeds might Combat Hunger in the Context of Climate Change

In between the narratives that bear the more extreme views on both ends, there is also a considerable narrative that encompasses more moderate views, namely that climate-ready seeds *might* contribute to tackling climate-induced hunger. The broad public consensus on climate change adaptation is that some active human intervention is necessary to successfully adapt to unavoidable changes in climatic conditions.[217] Similarly, there is widespread accord that agriculture is, and will continue to be, one of the hardest hit sectors, and that climate change is impacting, and will continue to impact, food security and hunger.[218] These conditions set the stage for accepting genetically engineered, climate-resilient seeds as tools in the struggle to adapt to climate-induced hunger. This narrative acknowledges the potential value of climate-ready seeds, but sometimes criticizes the way in which this proposed adaptation strategy is developed and used.

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[216] La Via Campesina, Friends of the Earth International, Combat Monsanto, 'Combatting Monsanto Grassroots: Resistance to the Corporate Power of Agribusiness in the Era of the 'Green Economy' and a Changing Climate', March 2012, http://www.viacampesina.org/downloads/pdf/en/Monsanto-Publication-EN-Final-Version.pdf, 4, last accessed on 22 July 2015.

[217] See the discussion in Chapter 2, section 1.1.2, where the 'realist' approach to adaptation is discussed. Klein and MacIver, Chapter 2 at note 22.

[218] See section 2.4.1 above.

A clear example of this moderate view comes from international agricultural research institutes. The Consultative Group on International Agricultural Research (CGIAR) is the largest international agricultural research consortium, consisting of 15 research centres located in different areas of the world. Initially an entirely publicly-funded initiative, the CGIAR focused on reducing poverty and world hunger through agricultural research and innovation. In 2006, the CGIAR released a statement entitled 'Intensified Research Effort Yields Climate-Resilient Agriculture to Blunt Impact of Global Warming, Prevent Widespread Hunger'.[219] The title of this press release in itself indicates confidence in the value of 'climate-resilient agriculture' for both adapting to climate change and preventing hunger. The content of the press release is more tempered than its title. It sets out the problems of declining crop yields as a result of climate change and indicates that, in the light of these problems, the CGIAR is promoting research and development of climate-resilient agriculture.[220] At the same time, the CGIAR clearly recognizes the limitations of climate-resilient seeds when it states that 'there are limits to the ability of new varieties to counteract the effects of heat, drought, and submergence'.[221] Despite this reservation, the report does reveal a belief that climate-ready seeds and technologies could contribute to providing a solution to reduced crop yields and hunger in the context of climate change.

Reports by the International Food Policy Research Institute (IFPRI) can also be viewed as feeding into this intermediate narrative. One IFPRI report, previously mentioned in this chapter, sets out a number of scenarios and policy options relating to climate change and food security. [222] It does not expressly mention agricultural biotechnologies, but the authors do make broad references to the importance of agricultural productivity and the dissemination of crop technologies to achieve the necessary yields.[223] Another IFPRI report, which centres on adaptation strategies for climate change impacts on agriculture, includes in its recommendations that '[c]rop and livestock productivity-enhancing research, including biotechnology, will be essential to help overcome stresses due to climate change'.[224] These reports do not explicitly advocate the development and use of climate-ready seeds, but they do contribute to creating a

[219] CGIAR, 'Intensified Research Effort Yields Climate-Resilient Agriculture to Blunt Impact of Global Warming, Prevent Widespread Hunger' Consultative Group on International Agricultural Research, http://www.cgiar.org/newsroom/releases/news.asp?idnews=521, last accessed on 22 July 2015.
[220] Ibid.: '… new research at CGIAR-supported centers focuses on understanding the impacts of climate on natural resources, such as water, fisheries, and forests, and on planning for improved management of these resources to meet the needs of growing populations as the climate changes.'
[221] Ibid.
[222] Nelson et al 2010, note 144 above.
[223] Ibid. See, for example, page 87 of the report: 'With sound policies and programs that encourage sustainable, broad-based economic growth, and *especially continued growth in agricultural productivity*, our scenarios suggest it is possible to achieve a large decline in the number of malnourished children – over 45 percent over the period from 2010 to 2050.' Emphasis added.
[224] Nelson et al. 2009, note 122 above, viii.

setting conducive to their promotion by highlighting the importance of agricultural production and biotechnologies.

Researchers at Wageningen University have contended that 'climate-ready GM crops can be of great help in adapting to a changing climate'.[225] However, they also emphasize that there must be prevention of 'unjust and unfair assignments of property rights' through 'an ethically acceptable IPR [intellectual property rights]' and 'just distribution of objects of innovation that are covered by patents'.[226] The suggestion here is that climate-ready seeds could be a valuable adaptation strategy, but that excessive intellectual property rights and an unfair distribution of those rights could prevent the benefits from this adaptation strategy to be realized.

These references reveal the emphasis on agricultural production, and the perceived value of biotechnologies in agriculture to attain adequate production. There are strong proponents of climate-ready seeds, strong opponents of climate-ready seeds, and those who consider that agricultural biotechnologies may contribute to increasing food production without expressing a clear view on climate-ready seeds. The next section will argue that contradictory narratives of climate-ready seeds exemplify the tensions within the neoliberal food regime.

3.4 CLIMATE-READY SEEDS, THE NEOLIBERAL FOOD REGIME, AND FOOD SOVEREIGNTY

This final section of this chapter will argue that the different narratives of climate-ready seeds reflect contentions within the neoliberal food regime, with the first narrative promoting 'neoliberal' means to combat hunger, and the second narrative opposing these neoliberal means in line with food sovereignty movements.

The narrative that promotes climate-ready seeds as an adaptation strategy and as a means to combat hunger in the face of climate change draws on 'neoliberal' features. Private sector seed corporations are the key players in this narrative, as the biggest investors in the development of climate-ready seeds. The dominance of seed corporations reflects the 'corporate' aspect of the neoliberal food regime.[227] Climate-ready seeds are developed using genetic engineering techniques, and seed corporations are increasingly applying for patent rights on the seeds.[228]

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[225] Cristian Timmermann, Henk van den Belt, and Michiel Korthals, 'Climate-Ready GM Crops, Intellectual Property and Global Justice' in *Global Food Security: Ethical and Legal Challenges*, ed. Carlos M. Romeo Casabona, Leire Escajedo San Epifanio, and Aitziber Emaldi Cirión (Wageningen, the Netherlands: Wageningen Academic Publishers, 2010), 153.
[226] Ibid., 155.
[227] See section 2.2 above on the neoliberal food regime.
[228] See section 3.1 above.

McMichael explains that, through the deployment of intellectual property rights, 'the biotechnology industry seeks to institutionalize gene patenting … as a key to elaborating a world agriculture … through the privatization of knowledge – a principal feature of the corporate food regime'.[229] Patent rights allow seed corporations to request the payment of fees for third parties to use the seeds. The seeds can then be seen as commodities that are sold in a marketplace.[230] The narrative promoting climate-ready seeds as a means to combat hunger reveals some of the key features of the neoliberal food regime.

The third narrative presented does not explicitly promote climate-ready seeds as means to fight climate-induced hunger. However, this narrative does leave the door open to considering climate-ready seeds as a possible solution.

The narrative that rejects the idea that climate-ready seeds can contribute to combating hunger seeks to counter what they view as a corporate monopoly over food production. The arguments made in this narrative reflect key ideas of food sovereignty movements. Proponents of food sovereignty argue that food security cannot be achieved through corporate domination of food production and trade, but rather through more local production and small-scale farming.[231] The second narrative of climate-ready seeds criticizes the reliance on genetic engineering techniques and the rising number of patent rights applied for by a small number of large corporations. This narrative argues that commodifying food will not alleviate hunger for those most vulnerable to the impacts of climate change.

Food sovereignty is sometimes articulated as a solution to climate change. La Via Campesina and GRAIN in the lead-up to the 2014 Climate Change Conference in Lima published two documents that 'detail how a global programme to support food sovereignty can resolve the climate crisis and feed the world'.[232] The Gaia Foundation also presents food sovereignty as a solution to climate change, in an item about the launch of the Alliance for Food

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[229] McMichael 2005, note 73 above, 281.

[230] This is in line with the neoliberal food regime. See section 2.2 above.

[231] See discussion about food sovereignty movements in section 2.3 above.

[232] La Via Campesina, 'Fight Climate Change with Food Sovereignty', 8 December 2014, http://viacampesina.org/en/index.php/actions-and-events-mainmenu-26/-climate-change-and-agrofuels-mainmenu-75/1710-fight-climate-change-with-food-sovereignty, last accessed on 22 July 2015. One document shows 'how the industrial food system contributes to the climate crisis' and argues that small-scale, local farming is the best solution to climate change (http://viacampesina.org/en/images/stories/pdf/Food%20and%20climate%20poster%2007.pdf); the second document argues that '[G]iving lands back to small farmers and indigenous communities is also the most effective way to deal with the challenges of feeding a growing global population in an era of climate chaos' http://viacampesina.org/en/images/stories/pdf/Food%20and%20climate%20op%20ed%20EN%2007.pdf).

Sovereignty in Africa.[233] The article cites an indigenous community leader in South Africa as saying that: 'The indigenous seeds from the indigenous knowledge are our hope to adapt with this climate change, and this is why we want food sovereignty.'[234] Eric Holt-Giménez likewise promotes food sovereignty as a solution to climate change, criticizing the 'endless techno-fixes' promoted by corporations.[235] The second narrative of climate-ready seeds reflects these criticisms that are expressed in terms of food sovereignty.

Food regime theorists have suggested that the tensions within the neoliberal regime could lead to the emergence of a new regime. Elisabeth Abergel has linked opposition to climate-ready seeds as an example of a tension, in writing that 'the flaws inherent within the technoscientific paradigm, which seem incompatible with the types of strategies needed for agriculture to cope with the effects of climate change, could signal the shift to a new food regime'.[236] The voices that reject the idea that climate-ready seeds can contribute to combating hunger in the face of climate change argue along the lines of food sovereignty movements, and could have a hand in the emergence of a new food regime.

The main intention here was to show that contradictory narratives of climate-ready seeds reflect the tensions that are present within the current neoliberal food regime. These narratives of climate-ready seeds and the tensions they reflect form the basis from which this research will proceed. The presentation of narratives of climate-ready seeds was not intended as a complete overview, but rather as an introduction to different perspectives. These narratives will be elaborated on in the course of this thesis.

CONCLUSION

The starting point of this research is the problem of hunger, and especially the predicted exacerbated hunger as a result of the impacts of climate change on food production. This first chapter has charted the main issues that form the foundation of the research. Part 1 defined hunger and food (in)security, presented two prevalent perceptions of hunger in terms of availability of food and access to food, and explained how hunger has recently come to be linked

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[233] The Gaia Foundation, 'Food Sovereignty as Solution to Climate Change', 8 December, 2011 http://www.gaiafoundation.org/blog/food-sovereignty-as-solution-to-climate-change, last accessed on 22 July 2015.
[234] Ibid.
[235] Eric Holt Giménez, 'Climate Change and Food Sovereignty: The People's Climate March', *The Huffington Post*, 9 November 2014, http://www.huffingtonpost.com/eric-holt-gimenez/climate-change-and-food-sovereignty_b_5801430.html, last accessed on 22 July 2015.
[236] Abergel, note 98 above, 272.

to human rights. Part 2 of this chapter presented food regimes as a theoretical framework through which to study hunger. Discussion in part 2 concentrated on the current neoliberal food regime and the tensions within this regime, as reflected through food sovereignty movements. Part 3 of this chapter introduced climate-ready seeds as a proposed and contentious adaptation strategy to climate-induced hunger. It set out contradictory accounts of climate-ready seeds in terms of narratives. Contradictory narratives are presented as exemplifications of the tensions within the neoliberal food regime.

The main research question that guides this exploration is: What role does international law play in finding ways to eradicate hunger? Law has featured only lightly in this chapter. Hunger was presented as a problem of human rights. Moreover, intellectual property law was referred to, particularly in terms of rising patent rights on climate-ready seeds. The possibility for corporations to apply for patent rights on seeds and crops is a feature of the neoliberal food regime, and it informs the narrative that promotes climate-ready seeds as a tool to combat hunger. Human rights – and particularly the right to food – are closely related to food sovereignty movements, and inform the narrative that rejects climate-ready seeds as a tool to combat hunger.

In exploring the role of international law, this research will go beyond brief references to patent rights and human rights, and examine the cumulative role of international law. This involves studying how different areas of international law contribute to framing the problem of hunger in the face of climate change. The first part of this chapter indicated that the way in which hunger is understood determines the solutions that are devised. The following chapters will explore three different areas of international law – climate change adaptation law, intellectual property law, and human rights law – as they are relevant for and invoked in narratives of climate-ready seeds. The central thesis argument is that how international law is framed and invoked has a hand in creating a context that is favourable for the promotion of climate-ready seeds as a means to combat hunger, and by extension, creating a context that reinforces the features of the neoliberal food regime.

2. CLIMATE CHANGE ADAPTATION LAW AND CLIMATE-READY SEEDS

INTRODUCTION

Climate-ready seeds are presented in some narratives as a possible adaptation strategy to the adverse impacts of climate change on agriculture and crop yields. The exploration of the role of international law commences in this chapter with international climate change adaptation law. This chapter will first introduce climate change adaptation, and explain how it moved from the periphery to the centre of attention in climate change discourse in recent years. Increased recognition for adaptation is coupled with legal regulation. The international legal framework that governs adaptation, as well as adaptation initiatives taken under the auspices of this framework, will also be set out in part 1 of this chapter. The following parts 2 and 3 will look into references made in climate change adaptation law that may suggest that climate-ready seeds are necessary adaptation strategies. The main argument in this chapter is that international climate change adaptation law contributes to creating an environment that values biotechnological solutions, and that invites and enables private sector engagement in adaptation. This conclusion reinforces some of the fundamental assumptions that underlie narratives of climate-ready seeds, and the neoliberal food regime more broadly, which will be discussed in Chapter 5.

1 CLIMATE CHANGE ADAPTATION

The first part of this chapter will introduce adaptation as one of the ways in which to address climate change. Special emphasis will lie on the recent surge of interest in adaptation strategies. The first section presents an introduction to the placement of adaptation within climate change discourse. This provides a setting in which to understand climate-ready seeds as a possible adaptation strategy. Some examples will be provided of recent adaptation initiatives at the international level. The second section will subsequently explore the international legal framework that relates to climate change adaptation.

1.1 ADDRESSING CLIMATE CHANGE

With the realization that climate change poses an urgent problem of unprecedented scale came a commitment to devise ways to respond to it. Early responses focused heavily on mitigating – or limiting – further anthropogenic climate change. Adaptation has gathered momentum in recent years. These developments will be discussed here, culminating in an overview of some international adaptation initiatives.

1.1.1 The IPCC Assessment Reports: Responding to Climate Change

Concerns about the consequences of climate change have overshadowed many other concerns in recent decades. In 1979, the first World Climate Conference was held in Geneva. During this conference, climate change[1] was identified as a serious problem with potentially grave consequences for human life.[2] In 1988, the World Meteorological Organization and the United Nations Environment Programme set up the Intergovernmental Panel on Climate Change (IPCC). The IPCC's stated aim is 'to provide the governments of the world with a clear scientific view of what is happening to the world's climate', which they attempt to realize in part through the publication of assessment reports, providing 'full scientific and technical assessment of climate change'.[3] The first IPCC assessment report was published in 1990.[4] Assessment reports consist of three volumes, each of them written by one of three working groups. At the time of the publication of the first assessment report, these working groups were as follows: a scientific assessment of climate change (working group I), impact assessment of climate change (working group II), and response strategies to climate change (working group III). The second assessment report of 1995 included adaptation and mitigation strategies under working group II, and economic and social dimensions of climate change under working group III. Reports 3 (2001), 4 (2007), and 5 (2013), discussed adaptation in working group II, and mitigation in working group III. The information included in progressive IPCC assessment reports provides a good

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[1] The IPCC, in its fourth assessment report, defines climate change as: 'a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity.' Intergovernmental Panel on Climate Change, *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. M.L. Parry et al. (Cambridge, UK: Cambridge University Press, 2007). See also: Chapter 1 at note 134.

[2] World Meteorological Organization, 'World Climate Conferences', https://www.wmo.int/pages/themes/climate/international_wcc.php#a, last accessed on 22 July 2015.

[3] 'Intergovernmental Panel on Climate Change (IPCC)', http://www.ipcc.ch/, last accessed on 22 July 2015.

[4] 'Intergovernmental Panel on Climate Change: Reports', http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml, last accessed on 22 July 2015.

indication of the developments in international climate change policies and strategies, with the urgency of adaptation gaining attention since the third assessment report in 2001.

The two main categories of responses to climate change are: 1) limiting the increase in average global temperatures (mitigation); and 2) coping with the impacts of climate change (adaptation).[5] In the first IPCC assessment report, mitigation received the most attention as a response to climate change. Adaptation was not yet mentioned. The urgency of also adapting to the consequences of climate change became particularly clear after the third IPCC assessment report in 2001, in which adaptation was addressed in a separate volume.[6] By this time, there was a general consensus that climate change could not be completely averted or sufficiently limited. The need to devise adaptation strategies became unavoidable. A 2011 working paper published by the Organization for Economic Cooperation and Development (OECD) stated that '[a]daptation to climate change is now widely recognised as an equally important and complementary response to greenhouse gas mitigation'.[7]

The climate change we are experiencing today, and the adaptation strategies devised to deal with its impacts, differ from past examples of adapting to changes in climate. The main differences are the recognition of the human contribution to causing climate change,[8] and the unprecedented pace at which climate is changing.[9] These particular aspects of current climate change have contributed to the way in which adaptation strategies are shaped. Anthropogenic climate change has generated a heavier obligation on developed states, who have been the biggest carbon emitters, to undertake action to ensure effective adaptation to inevitable consequences that affect developing countries in particular.[10] Moreover, the pace of current

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[5] These two categories of responses to climate change are evident in the IPCC assessment reports, which since 2001 contain one volume on adaptation and one on mitigation. The United Nations Framework Convention on Climate Change (UNFCCC) clearly articulates these two broad responses, note 45 below.

[6] IPCC 2007, note 1 above.

[7] Shardul Agrawala et al., 'Private Sector Engagement in Adaptation to Climate Change: Approaches to Managing Climate Risks' *OECD Environment Working Papers Series No.39* (OECD, 2011), 9.

[8] The fourth IPCC assessment report concluded that 'most of the observed increase in the globally averaged temperature since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations'. 'Very likely' is taken to mean between 90 and 99 per cent probability here. IPCC 2007, note 1 above, 9 and 4, respectively.

[9] See, for example: Alex Kirby, 'Unprecedented Climate Extremes Marked Last Decade, Says UN' *The Guardian*, 3 July 2013, www.theguardian.com/environment/2013/jul/03/unprecedented-climate-extremes-last-decade-un, last accessed on 22 July 2015.

[10] Anthropogenic climate change also presents questions about justice. Jouni Paavola and W. Neil Adger have written in this regard: 'Adaptation to climate change presents formidable dilemmas of justice to the international community. Anthropogenic climate change is caused predominantly by greenhouse gas emissions of developed countries, while the climate change impacts will disproportionately burden developing countries.' Jouni Paavola and W. Neil Adger, 'Justice and Adaptation to Climate Change' *Tyndall Centre Working Paper No.23* (Norwich, UK: Tyndall Centre for Climate Change Research, October 2002), 2.

climate change heightens the sense of urgency that new and faster modes of adaptation are needed.

1.1.2 Adaptation from the Periphery to the Spotlight

The term 'adaptation' was originally used by ecologists to describe 'the evolutionary process by which living organisms mould into a new environment'.[11] In terms of climate change, adaptations refer to 'the processes and actions that enable people to cope better with increasingly challenging weather and climatic conditions'.[12] In this definition, Emma Tompkins and Hallie Eakin use the plural word 'adaptations', which indicates that adapting to climate change does not refer to any single action, but rather a range of actions and processes. Climate change has consequences for many aspects of life.[13] Adaptations to climate change must therefore vary, from relatively simple adaptations – such as using mosquito nets to limit the spread of malaria and installing air conditioning to cope with higher temperatures – to far more complicated and expensive adaptations, such as building dikes and dams to prevent flooding.[14] Shardul Agrawala attributes the earlier, relative, lack of attention to adaptation partly to the difficulty with 'defin[ing] what falls under the purview of adaptation'.[15]

The process of identifying and devising different adaptations to climate change is influenced by different approaches to climate change. As these approaches have progressed and changed over the years, so have adaptation strategies. In a review of the second IPCC assessment report, Robert Kates identifies two distinct approaches to climate change that

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[11] Janet Abramovitz et al., 'Adapting to Climate Change: Natural Resource Management and Vulnerability Reduction' Background Paper to the Task Force on Climate Change, Adaptation and Vulnerable Communities (World Conservation Union (IUCN); Worldwatch Institute; International Institute for Sustainable Development (IISD); Stockholm Environment Institute /Boston (SEI-B), 2002). As Ian Burton et al. make clear, the focus of adaptation policies has been on adaptation to climate change as if these have to be developed from the ground up. It must be remembered, these authors argue, that humans and their environment have always had to adapt to their climate, and adaptation policy already exists, even though it is usually not specifically called by that name. Nevertheless, current climate change is different in scale and urgency, and therefore is perceived to require more wide-scale and urgent adaptation action. Ian Burton et al., 'From Impacts Assessment to Adaptation Priorities: The Shaping of Adaptation Policy' *Climate Policy* 2 (2002), 10.

[12] Emma L. Tompkins and Hallie Eakin, 'Managing Private and Public Adaptation to Climate Change' *Global Environmental Change* 22 (February 2012), 1.

[13] Nicolas H. Stern, *A Blueprint for a Safer Planet: How to Manage Climate Change and Create a New Era of Progress and Prosperity* (London: Bodley Head, 2009); Rachel Warren et al., 'Understanding the Regional Impacts of Climate Change: Research Report Prepared for the Stern Review on the Economics of Climate Change' *Tyndall Centre Working Paper No.90* (Norwich, UK: Tyndall Centre for Climate Change Research, September 2006).

[14] For example, the Dutch Delta Works, the biggest dam and dike project in the world. The expansion of the delta works has been called 'adaptive delta management' in the area of climate change adaptation. See Delta Programme Commissioner, 'Adaptive Delta Management', http://www.deltacommissaris.nl/english/delta-programme/what-is-the-delta-programme/adaptive-deltamanagement/, last accessed on 22 July 2015.

[15] Shardul Agrawala et al., 'Adaptation and Innovation: An Analysis of Crop Biotechnology Patent Data' *OECD Environment Working Papers No. 40* (OECD, 2012), 9.

prevailed at the time of the writing of the report in 1996.[16] The first approach is the 'preventionist' approach, departing from the perspective that anthropogenic climate change could have catastrophic consequences for life on our planet and must therefore be mitigated.[17] Preventionists view adaptation policies as a distraction from the main aim of mitigation. This view is reiterated by Roger Pielke, Jr., who writes that proponents of adapting to the impacts of climate change are often seen as 'weak', in the sense that they have given up on trying to mitigate. Mitigation is seen as a 'strong' strategy, in the sense that anthropogenic climate change is being averted, rather than accepting the inevitable and adapting to it.[18]

Kates identifies the second approach as 'adaptationist'.[19] In this approach, both nature and humans are held to have, throughout history, successfully adapted to changing conditions and circumstances, and that this will also hold true for current climate change. The adaptationist approach sees active adaptation policies as interfering with these 'natural' adaptations. Adaptationists, unlike preventionists, believe that climate change will not be catastrophic, but rather moderate enough to adapt to naturally.[20] Neither of these approaches considers active anthropogenic adaptation to climate change to be necessary. The review that Kates wrote of the second IPCC assessment report stated that 'the notion of adaptation figures prominently in the second volume's title and section headings, but, alas, it does not play a major role in the content'.[21]

Klein and Donald MacIver later identified a third approach to climate change, namely the 'realist' approach.[22] This approach recognizes the seriousness and potentially catastrophic consequences of climate change, but simultaneously acknowledges the great uncertainty involved in climate science. The realists, unlike the preventionists and adaptationists, promote the importance of devising and implementing adaptation policies, but at the same time understand that the success of such policies will take time to be realized.[23] Whereas in the preventionist and adaptationist approaches adaptation to climate change was denied a significant role, the realist approach opened the door for the development of serious adaptation strategies. In a 1998 article on the role of adaptation in climate policy, Pielke, Jr., expounded reasons why adaptation should

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16 Robert W. Kates, 'Climate Change 1995 – Impacts, Adaptations, and Mitigation' *Environment* 39 (2002), 31-32.
17 Ibid.
18 Roger A Pielke Jr., 'Rethinking the Role of Adaptation in Climate Policy' *Global Environmental Change* 8 (1998), 162.
19 Kates 2002, note 16 above, 31-32.
20 Ibid.
21 Ibid., 31.
22 Richard J.T. Klein and Donald C. MacIver, 'Adaptation to Climate Variability and Change: Methodological Issues' *Mitigation and Adaptation Strategies for Global Change* 4 (1999), 190.
23 Ibid. See also: Richard J.T. Klein, 'Adaptation to Climate Variability and Change: What Is Optimal and Appropriate?' in *Climate Change in the Mediterranean: Socio-Economic Perspectives of Impacts, Vulnerability and Adaptation*, ed. Carlo Giupponi and Mordechai Schechter (Cheltenham: Edward Elgar, 2002), 2.

be as much part of climate policy as mitigation. The two main points he argues are that mitigation efforts may not be (entirely) successful, and therefore some adaptation would be necessary, and even if mitigation succeeds, adaptation may still be needed because of the projected damage by past emissions, regardless of future emissions reductions.[24] In sum, the realist approach recognizes that something must be done to adapt to the impacts of climate change, however uncertain.

The third, fourth, and fifth assessment reports from 2001, 2007, and 2013, respectively, take much more heed of adaptation strategies. The fourth assessment report stated that 'for impacts that already show or will show in the very near future, adaptation is *the only available and appropriate response*'.[25] This recognition that adapting to inevitable impacts of climate change is needed, has triggered the generation of international adaptation initiatives.

1.1.3 Overview of International Adaptation Initiatives

Some of the main international adaptation initiatives will be outlined here, namely the Cancun Adaptation Framework (CAF),[26] the Nairobi Work Programme (NWP),[27] and the National Adaptation Programmes of Action (NAPAs).[28] This is not intended as a complete overview, but rather as a selection of some of the main adaptation initiatives in the international arena. They are implemented under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC), which will be examined in section 1.2 below.[29] The purpose of laying out these adaptation initiatives is to demonstrate the increasing notice given to the need to adapt to the impacts of climate change, as well as to signal trends in the international view on adaptation.

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[24] Pielke Jr. 1998, note 18 above, 160. Here, Pielke quotes William Nordhaus who stated that '[m]itigate we might, adapt we must (Nordhaus 1994)'.

[25] IPCC 2007, note 1 above, 19. Emphasis added.

[26] The CAF was adopted at the 2010 Climate Change Conference in Cancun. Its primary objective is 'to enhance action on adaptation, including through international cooperation and coherent consideration of matters relating to adaptation under the Convention'. United Nations Framework Convention on Climate Change. Decision 1/CP.16: The Cancun Agreements: Outcome of the Work of the Ad Hoc Working Group on Long-Term Cooperative Action, Section II Enhanced Action on Adaptation. 2011, paras 11-35. See also: 'Cancun Adaptation Framework', http://unfccc.int/adaptation/items/5852.php, last accessed on 22 July 2015.

[27] The NWP was established at the 2005 Conference of the Parties (COP). It is a mechanism established under the UNFCCC and its aim is to 'facilitate and catalyze the development and dissemination of information and knowledge that would inform and support adaptation policies and practices'. 'Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change (NWP)', https://www3.unfccc.int/pls/apex/f?p=333:1:543895928838350, last accessed on 22 July 2015.

[28] NAPAs are part of a work programme for least developed countries, established at the 2001 meeting of the COP. The main aim of NAPAs is to 'provide a process for the LDCs to identify priority activities that respond to their urgent and immediate needs with regard to adaptation to climate change'. UNFCCC, 'Background Information on the NAPAs', unfccc.int/adaptation/workstreams/national_adaptation_programmes_of_action/items/7572.php, last accessed on 22 July 2015.

[29] See, for an overview of adaptation strategies by the UNFCCC: United Nations Framework Convention on Climate Change, 'Adaptation', http://unfccc.int/adaptation/items/4159.php, last accessed on 22 July 2015.

The CAF was adopted at the 2010 Climate Change Conference, and affirmed recognition that adaptation must be addressed with the same level of urgency and priority as mitigation.[30] The main aim of the CAF is to strengthen action taken in terms of adapting to the impacts of climate change. Adaptation action called for in the CAF especially 'seeks to reduce vulnerability and build resilience in developing country Parties', those regions, countries, and peoples most vulnerable to the impacts of climate change.[31] An important aspect of the CAF is international cooperation and the engagement of various stakeholders. Developed country governments are called upon to provide support to less developed countries in devising, financing, and implementing adaptation actions. In addition to calling on states, the CAF also invites '[r]elevant multilateral, international, regional and national organizations, the public and private sectors, civil society and other relevant stakeholders … to undertake and support enhanced action on adaptation at all levels'.[32]

The NWP on impacts, vulnerability, and adaptation to climate change has a twofold objective, namely to assist all States Parties (to the UNFCCC) in order to:

(1) improve their understanding and assessment of impacts, vulnerability and adaptation to climate change; and
(2) make informed decisions on practical adaptation actions and measures to respond to climate change on a sound scientific, technical and socio-economic basis, taking into account current and future climate change and variability.[33]

Like the CAF, the NWP places particular emphasis on the needs of developing countries. The NWP is likewise addressed not only to states, but also to a wide range of stakeholders who can become involved by taking a so-called 'Action Pledge'. Stakeholders include 'organizations, institutions, and private sector companies'. Emphasis on developing countries' needs is also evident in the National Adaptation Programmes of Actions. NAPAs are part of the Least Developed Countries (LDC) work programme, established in 2001[34] 'to support LDCs to

[30] 'Cancun Climate Change Conference – November 2010', http://unfccc.int/meetings/cancun_nov_2010/meeting/6266.php, last accessed on 22 July 2015.
[31] CAF, note 26 above.
[32] UNFCCC, 'Cancun Adaptation Framework', unfccc.int/adaptation/items/5852.php, last accessed on 22 July 2015.
[33] NWP, note 27 above.
[34] The LDC Work Programme was established at the seventh Conference of the Parties meeting (COP 7) in 2001 in Marrakesh. Its aim is to help LDCs in developing national adaptation strategies and building capacity. See: 'Adaptation Milestones', http://unfccc.int/focus/adaptation/items/6999txt.php; 'Least Developed Countries Portal', http://unfccc.int/adaptation/knowledge_resources/ldc_portal/items/4751.php.

address the challenge of climate change given their particular vulnerability'.[35] They are undertaken as an effort to implement specific principles of the United Nations Framework Convention on Climate Change. The main stakeholders are, however, 'grassroots communities', and individual countries are responsible for completing and submitting their national programmes of action to the UNFCCC secretariat. Submitted country reports suggest that cooperation with other stakeholders, including notably private sector entities, is perceived to be important in realizing adaptation strategies, and the lack of private sector involvement is sometimes referred to as problematic.[36]

These adaptation initiatives are also paired with funds set up to finance their implementation, including the Adaptation Fund, the Special Climate Change Fund, and the Least Developed Nations Fund, all established in 2001.[37] The two main trends in understanding adaptation to climate change can be identified through these adaptation initiatives, namely a heavy emphasis on the most vulnerable developing countries and a strong call for cooperation among a wide range of stakeholders. These trends contribute to establishing the state of affairs in which climate-ready seeds have come to be considered adaptation strategies devised to address the problem of hunger in the face of climate change in particular. The legal framework of climate change adaptation will be set out next.

1.2 INTERNATIONAL LEGAL FRAMEWORK OF CLIMATE CHANGE ADAPTATION

Responses to climate change also involve international legal regulation. This section will examine which international laws regulate adaptation, what these laws stipulate, and finally, how they are relevant for discourses on climate-ready seeds.

1.2.1 International Climate Change Adaptation Law

The previous section has introduced the IPCC assessment reports and a number of adaptation initiatives, but they do not constitute international legal texts. Even though adaptation to changing conditions is by no means a new phenomenon, the scale and urgency of current climate change calls for new adaptation strategies, and in relation therewith legal regulation of those

[35] UNFCCC, 'Background Information on the NAPAs', unfccc.int/adaptation/workstreams/national_adaptation_programmes_of_action/items/7572.php, last accessed on 22 July 2015.

[36] See below in section 3.1, especially the reference in Angola's National Adaptation Programme of Action, at note 152.

[37] Jonathan Verschuuren, 'Climate Change Adaptation under the United Nations Framework Convention on Climate Change and Related Documents' in *Research Handbook on Climate Change Adaptation Law*, ed. Jonathan Verschuuren (Cheltenham, UK; Northampton, MA, USA: Edward Elgar, 2013), 24.

strategies. Jan McDonald has articulated that '[l]egal institutions and instruments will play an important role in climate change adaptation', and that '[l]aw can facilitate adaptation'.[38]

Which international laws regulate climate change adaptation strategies? The scale of the impacts of climate change is enormous, and adaptations are required across sectors and at many different levels. Considering the scope and diversity of climate change impacts, responses in terms of adaptation are also necessarily widespread and diverse. There is consequently not one distinctive and exclusive legal regime that regulates climate change in its entirety. Jouni Paavola and W. Neil Adger write that '[a]daptation to climate change is governed by international environmental law', as well as international law more broadly – including treaty law and custom.[39] They refer to the 'climate change regime' as 'the collection of principles, norms, rules, and decision-making procedures around which actor expectations converge' in the field of climate change.[40] In a later article, J.B. Ruhl and James Salzman refer to international climate change adaptation law as 'a collection of fields independently adapting to climate change – rather than organically coalescing into a new and distinct field'.[41] These fields include agricultural law, water law, property law, land law, etc. The argument Ruhl and Salzman make is that separate fields of law are flexible enough to incorporate issues of climate change into their regulations.[42] Robert Keohane and David Victor have written about 'the regime complex for climate change',[43] explained as 'a set of loosely coupled regimes' rather than one 'integrated, comprehensive regime'.[44]

International climate change adaptation law is therefore difficult to define as a distinct and clearly defined field of law. The international legal regulation of climate change adaptation is multifaceted, and consists of an interaction between many different and already existing areas of law that are now being employed in the context of climate change. Notwithstanding the legal complexity in dealing with climate change, legal texts do exist that deal explicitly with climate change. The next section will introduce this legal framework and focus on how it deals with adaptation specifically.

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[38] Jan McDonald, 'The Role of Law in Adapting to Climate Change' *WIREs Climate Change* 2 (March/April 2011), 283.
[39] Jouni Paavola and W. Neil Adger, 'Fair Adaptation to Climate Change' *Ecological Economics* 56 (2006), 597-598.
[40] Ibid., 598.
[41] J.B. Ruhl and James Salzman, 'Climate Change Meets the Law of the Horse' *Duke Law Journal* 62 (2013), 976. Ruhl and Salzman liken climate change adaptation law to cyberspace law in the mid-1990s; a new issue that is regulated by a range of legal fields rather than one new legal regime.
[42] Ibid., 1015.
[43] Keohane, Robert O. and David G.Victor. 'The Regime Complex for Climate Change' Discussion Paper 2010-33, Cambridge, MA: Harvard Project on International Climate Agreements, January 2010.
[44] Ibid., 1.

1.2.2 UNFCCC and Kyoto Protocol on Adaptation

During the second World Climate Conference in 1990, preparations were made for the creation of an international treaty on climate change. The United Nations Framework Convention on Climate Change (UNFCCC or Convention) came into being in 1992.[45] The aim of the UNFCCC is 'to cooperatively consider what [States Parties] could do to limit average global temperature increases and the resulting climate change, and to cope with whatever impacts were, by then, inevitable'.[46] Although the objectives of the UNFCC include both mitigation and adaptation, the treaty text focuses mostly on mitigation. Notably, the Convention states that its 'ultimate objective' is the stabilization of greenhouse gas concentrations, in other words, mitigation.[47] To further enforce carbon emissions reductions – especially on developed countries – the Kyoto Protocol was adopted in 1997.[48] The Kyoto Protocol aims primarily at making countries commit to realizing emissions reductions to mitigate climate change. While both the UNFCCC and the Kyoto Protocol mainly focus on mitigation, they also provide the international legal framework for 'state obligations to conduct adaptation measures and thus enhance adaptive capacity'.[49]

There are a few general references to adaptation in the texts of the UNFCCC and the Kyoto Protocol. Article 4(1)(b) UNFCCC and article 10(b) Kyoto Protocol stipulate obligations for States Parties to '[f]ormulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures … to facilitate adequate adaptation to climate change'.[50] Article 4(1)(e) UNFCCC furthermore urges States Parties to '[c]ooperate in preparing for adaptation to the impacts of climate change'.[51] These references, despite explicitly naming adaptation, remain very broad and open to interpretation. In these legal texts, adaptation does not refer to any specific type of adaptation, and could cover a whole range of measures, provided they 'facilitate' adaptation to the impacts of climate change. In what ways adaptation can be facilitated is not further clarified in these articles. Both the UNFCCC and the Kyoto Protocol refer to 'adequate' adaptation. As with the term 'facilitate', the articles fail to specify

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[45] 1992 United Nations Framework Convention on Climate Change, 1771 U.N.T.S. 107 (1992).

[46] UNFCCC, 'Background on the UNFCCC: The International Response to Climate Change', unfccc.int/essential_background/items/6031.php, last accessed on 22 July 2015.

[47] UNFCCC article 2: 'The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.'

[48] 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change, 37 I.L.M. 22 (1998).

[49] Roda Verheyen, 'Adaptation to the Impacts of Anthropogenic Climate Change: The International Legal Framework' *Review of European Community & International Environmental Law* 11 (17 December 2002), 129. See also: Verschuuren, note 37 above, 16.

[50] UNFCCC, note 45 above; Kyoto Protocol, note 48 above.

[51] UNFCCC, note 45 above.

what is meant by 'adequate'. The open-endedness of stipulations on adaptation within the international legal framework can be attributed to the initial emphasis on mitigating the effects of climate change, as well as the uncertainties surrounding the course and consequences of future climate change, and the subsequent need to capture a wide range of adaptations across sectors and regions. The references to adaptation in the UNFCCC and the Kyoto Protocol leave a great deal of space for devising adaptation strategies.

This space created by the legal framework in the UNFCCC and the Kyoto Protocol is filled by for instance adaptation initiatives, some of which were mentioned in section 1.1 above. Although these initiatives are not legal instruments, they can be seen to act in line with the broad international legal framework on adaptation. The Cancun Adaptation Framework, the Nairobi Work Programme, and the National Adaptation Programmes of Action are undertaken under the auspices of the UNFCCC. For the purpose of this research, international law on climate change adaptation refers to both the legal framework defined by the UNFCCC and the Kyoto Protocol, as well as programmes, funds, reports, and actions taken in line with this legal framework and filling up the space created by this framework.[52]

The main interest in this research is to explore the context that is created through international law and legal discourse relating to climate change adaptation, and how this influences narratives on climate-ready seeds. The focus will be on the texts of the UNFCCC and the Kyoto Protocol, as well as the legal discourse that shapes how its provisions related to adaptation are shaped and interpreted. The next parts of this chapter will examine specifically what international climate change adaptation law says about the use of genetically engineered climate-resilient seeds and the involvement of the private sector. The argument that will be made is that by emphasizing the value of agricultural biotechnologies and providing an enabling environment for private sector engagement in adaptation, climate change adaptation law is conducive to 'neoliberal' solutions to climate-induced hunger.

2 THE USE OF AGRICULTURAL BIOTECHNOLOGIES IN CLIMATE CHANGE ADAPTATION

It has been broadly acknowledged that climate change poses serious problems for agricultural production, and consequently is predicted to exacerbate global hunger.[53] There is a sense that the

[52] See the Introduction to this thesis, at section 6.
[53] See the discussion in Chapter 1, section 3.1.

agricultural sector must adapt to climate change by adjusting crop varieties.[54] Climate-ready seeds are presented as one possible adaptation strategy to the impacts of climate change on agriculture. Contradictory narratives of climate-ready seeds, as introduced in Chapter 1, reveal discord about whether genetically engineered seeds are appropriate and effective adaptation tools. This part of the current chapter will examine what the UNFCCC and the Kyoto Protocol, as well as adaptation initiatives and other legal discourse, say about the use of genetically engineered climate-resilient seeds as potential adaptation tools. The first section will look into the use of technological solutions in general terms, and how this relates to climate change adaptation. The second part will then discuss some specific examples of how climate change adaptation law promotes the use of genetic engineering in agriculture as part of climate adaptation strategies. The main argument that will be made is that international climate change adaptation law contributes to creating a context that acknowledges and endorses the use of genetically engineered seeds for adaptation.

2.1 THE FETISH OF TECHNOLOGY

The development of new technologies associated with industrialization has, according to many, allowed parts of the world to develop rapidly,[55] and has concurrently contributed to excessive carbon emissions that are at the root of anthropogenic climate change.[56] From this perspective, technologies have contributed to causing climate change. At the same time, they are presented as possible solutions to climate change, for instance in the case of climate-ready seeds. Stephen Axon has written that:

> Although the use of old technology is considered to have caused the issue of climate change (Gore, 2006), it is widely perceived that scientific progress with new technology is the best way forward towards addressing climate change.[57]

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[54] Verschuuren, note 37 above, 5: 'The agricultural sector will also have to adjust crop variety depending on the changing climate and weather conditions.'

[55] See, for instance: United Nations Development Programme, 'Human Development Report 2001: Making New Technologies Work for Human Development' (New York, Oxford: UNDP, 2001).

[56] This is reiterated again in the latest IPCC assessment report. Intergovernmental Panel on Climate Change, *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. T.F. Stocker et al. (Cambridge, UK, and New York, NY, USA: IPCC, 2013). See also: Introduction at note 3.

[57] Stephen Axon, 'Addressing Climate Change and the Role of Technological Solutions' *Human Geographies* 4 (2010), 50.

Contradictory narratives of climate-ready seeds reveal a discord in how these technologies are perceived, with seed corporations promoting genetically engineered seeds, and critical NGOs rejecting the reliance on such technologies.[58]

Representatives of the AgBioWorld Foundation[59] have referred to agricultural biotechnology as 'technology that will save billions from starvation'.[60] The Union of Concerned Scientists, however, argues on the basis of field tests that genetically engineered crops do not produce higher yields than conventionally bred crops.[61] If climate-ready seeds do not in fact increase food production, then it seems unlikely that this technology will contribute to saving billions from starvation in the face of climate change. Moreover, critics also argue that even if technological innovation is successful, it will not necessarily benefit those who need it most.[62]

Contentions about the value of genetically engineered climate-resilient seeds can be seen in the light of more general controversies about the value of technologies. David Harvey writes about the 'fetish of technology', explaining that: '[T]he fetish arises because we endow technologies – mere things – with powers they do not have (e.g., the ability to solve social problems, to keep the economy vibrant, or to provide us with a superior life).'[63] The belief that 'there is a technological fix for each and every problem'[64] is more broadly a characteristic of neoliberalism. In a commentary in *Nature*, Daniel Sarewitz and Richard Nelson caution against using technological fixes out of context. They argue that not all problems can be solved using technology, and perhaps more importantly, that technology by itself is not enough.[65] John Bellamy Foster echoes these criticisms specifically regarding technologies as used in climate change strategies. He writes that 'the dominant response [to climate change] is to avoid all questions about the nature of our society, and to turn to technological fixes or market mechanisms of one sort or another'.[66] Bellamy Foster argues that technology alone will not

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[58] See Chapter 1, section 3.2 for an overview of the narratives of climate-ready seeds.
[59] AgBioWorld Foundation is a non-profit organization based in Alabama that promotes agricultural biotechnologies. See, for more information: www.agbioworld.org, last accessed on 22 July 2015.
[60] C.S. Prakash and Gregory Conko, 'Technology That Will Save Billions from Starvation' *AgBioWorld*, 1 March 2004, http://www.agbioworld.org/biotech-info/articles/agbio-articles/save-billions.html, last accessed on 22 July 2015.
[61] Doug Gurian-Sherman, 'Failure to Yield: Evaluating the Performance of Genetically Engineered Crops' (Cambridge, MA: Union of Concerned Scientists, 2009). See also: Chapter 1 at note 198. Doug Gurian-Sherman, 'High and Dry: Why Genetic Engineering Is Not Solving Agriculture's Drought Problem in a Thirsty World' (Cambridge, MA: Union of Concerned Scientists, June 2012). See also: Chapter 1 at note 200.
[62] Onora O'Neill, 'Ending World Hunger' in *World Hunger and Morality*, ed. William Aiken and Hugh LaFollette (Upper Saddle River, New Jersey: Prentice Hall, 1996), 92. See also: Chapter 1 at note 207.
[63] David Harvey, 'The Fetish of Technology: Causes and Consequences' *Macalester International* 13 (2003), 3.
[64] David Harvey, *A Brief History of Neoliberalism* (Oxford: Oxford University Press, 2007), 68-69.
[65] Daniel Sarewitz and Richard Nelson, 'Three Rules for Technological Fixes' *Nature* 456 (December 2008).
[66] John Bellamy Foster, 'Why Ecological Revolution?' *Monthly Review* 61 (2010).

suffice in addressing the problems caused by climate change, but that a 'revolution of our social system'[67] is required, as well.

Contentions around the extent of reliance on technologies are also present in discussions about food systems. John Thompson and Ian Scoones have written about two opposing views on agricultural science that incorporate different views on technology.[68] One view incorporates molecular biology and genetic engineering, and focuses on posing 'specific questions and empirical hypotheses'.[69] Emphasis on the need to increase crop yields to address hunger can be seen as reflecting this view. The authors call this the 'production/innovation narrative', and write that:

> One of the most compelling core narratives framing agricultural policy and practice relates to the application of scientific knowledge to agriculture, linked to a linear view of modernisation, often influenced strongly by Malthusian concerns about increasing food production to meet growing populations and avert famine.[70]

This first view articulated by Thompson and Scoones is in line with the narrative that promotes climate-ready seeds as an adaptation strategy. This view highly values technological solutions, and the authors identify it as the most dominant view.[71]

Another view presented by Thompson and Scoones is a 'holistic stream' that 'can be characterised as a science of integration'.[72] This view pays attention to agricultural science as a complex field, involving not only questions of how agricultural production can improve, but also focusing on larger and interrelated social and economic factors. The authors present this as an alternative to the dominant narrative,[73] and this view is in line with the idea of food sovereignty.[74] This view emphasizes small-scale agriculture, local production, 'farming with nature' without the use of artificial inputs, and using indigenous knowledge, among other things.[75]

Thompson and Scoones conclude their argument by writing that 'the technology-fix approach, including those currently available from biotechnology, offer solutions only at the

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[67] Ibid.
[68] John Thompson and Ian Scoones, 'Addressing the Dynamics of Agri-Food Systems: An Emerging Agenda for Social Science Research' *Environmental Science & Policy* 12 (2009).
[69] Ibid., 387.
[70] Ibid., 389.
[71] Ibid., 391.
[72] Ibid., 387.
[73] Ibid., 391-392.
[74] Ibid., 394.
[75] Ibid., 391-392.

margins and to affluent commercial farmers, consequently a wider search for different socio-technological solutions and innovation pathways is needed'.[76] Geneticist Jack Heinemann, in a commentary for a UN conference on trade and development focusing on biotechnology for food security and climate change policy, argues that '[t]he current failures to feed the world are not due to limitations of technology, but to social choices'.[77] He reinforces the findings by the Union of Concerned Scientists[78] in confirming that there are to date 'no commercially available GM plants with traits that reduce the effects of abiotic stress'.[79] Technology, therefore, does not provide a complete solution to the problem of hunger in the face of climate change.

The remainder of this part of the chapter will show that despite criticisms of overreliance on technological solutions, international climate change adaptation law promotes the use of technologies (and specifically genetically engineered seeds) in adaptation. The way in which adaptation law and discourse is framed contributes to reinforcing the value of (agricultural bio)technologies in adaptation.

2.2 LAW PROMOTING THE USE OF AGRICULTURAL BIOTECHNOLOGY IN ADAPTATION

This section will first survey the references made to technologies in the texts of the UNFCCC and the Kyoto Protocol. Then it will examine references to technologies in some of the main adaptation initiatives. The last part of this section will look into more specific references to agricultural biotechnologies and climate-resilient seeds in two reports written under the auspices of the IPCC and the UNFCCC.

2.2.1 References to Technological Solutions in the UNFCCC and the Kyoto Protocol

The texts of the UNFCCC and the Kyoto Protocol contain numerous references to the words 'technology', 'technologies', and 'technological'.[80] Most of these references pertain to calls for transfer of existing technologies from developed to developing countries. For instance, Article 4(5) stipulates the following as one of the commitments to be made by States Parties:

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[76] Ibid., 394.

[77] Jack A. Heinemann, Ch.4 Commentary VI: 'Genetic Engineering and Biotechnology for Food Security and for Climate Change Mitigation and Adaptation: Potential and Risks' in Trade and Environment Review 2013: 'Wake Up Before It Is Too Late: Make Agriculture Truly Sustainable Now for Food Security in a Changing Climate' United Nations Conference on Trade and Development, (Geneva: UNCTAD, 2013), 203.

[78] Gurian-Sherman 2009, note 61 above.

[79] Heinemann, note 77 above, 208.

[80] On the basis of a cursory count, these terms are mentioned 21 times in the text of the UNFCCC and 18 times in the text of the Kyoto Protocol. About half of the latter references are to the Subsidiary Body for Scientific and Technological Advice.

> The developed country Parties and other developed Parties … shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and knowhow to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention.

In addition to the transfer of existing technologies, some references also explicitly mention 'new technologies'.[81] One of the clearest examples of the use of technology in addressing climate change is the development of renewable energy technologies as a way to reduce current carbon emissions, and thereby mitigate the effects of climate change. The text of the Kyoto Protocol promotes the use of such technologies.[82] As the discussion in the previous section of this chapter showed, there can be much debate on whether (over)reliance on technology is the best way forward in adapting to the impacts of climate change. References to 'technologies' in the text of the UNFCCC and the Kyoto Protocol suggest that technologies can be valuable in addressing climate change.

The texts of the UNFCCC and the Kyoto Protocol are intentionally broad and open-ended. Moreover, the references to the transfer and use of technologies are most explicitly aimed at mitigation, because of the disproportionate focus – until recently – on mitigation measures. Nevertheless, the legal framework of climate change is directed at mitigation and adaptation. The references to technologies can therefore be seen as broad acknowledgements of technological solutions being necessary to address climate change, both in terms of mitigating further adverse effects and adapting to already irreversible effects. International adaptation initiatives contain more explicit references to technological solutions to adaptation.

2.2.2 Technologies for Agricultural Adaptation in Adaptation Initiatives

While the texts of the UNFCCC and the Kyoto Protocol contain very broad and open-ended reference to adaptation,[83] several adaptation initiatives launched by the UNFCCC[84] give a clearer

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[81] For instance, in the preamble of the UNFCCC: '[A]chieving greater energy efficiency and for controlling greenhouse gas emissions in general, including *through the application of new technologies* on terms which make such an application economically and socially beneficial.' Emphasis added.

[82] Article 2 (1)(a)(iv) of the Kyoto Protocol states that each state member to the Protocol shall implement and enhance policies, including: 'Research on, and promotion, development and increased use of, new and renewable forms of energy, of carbon dioxide sequestration technologies and of advanced and innovative environmentally sound technologies.'

[83] See section 1.2.2 above.

[84] See, for an overview of some of the main adaptation initiatives, section 1.1.3 above.

idea of what 'facilitating adequate adaptation' may look like. The Cancun Adaptation Framework, as discussed above, aims 'to enhance action on adaptation, including through international cooperation and coherent consideration of matters relating to adaptation under the Convention'.[85] The development and transfer of technology is an important means through which the CAF seeks to realize mitigation and adaptation aims. The report of the Cancun Conference of the Parties meeting at which the CAF was established, contains also a section on 'Technology Development and Transfer'. It notes the necessity of 'scaling up of the development and transfer of technology to developing country Parties' as a way to 'support action on mitigation and adaptation in order to achieve the full implementation of the Convention'.[86] Among other things, the CAF aims to support and enable least developed countries to develop national adaptation plans.[87] The National Adaptation Programmes of Action[88] provide information from these least developed countries on adaptation needs and proposals.[89]

The texts of the NAPAs submitted by least developed countries also include references to technologies. Until now, 50 NAPAs have been received at the secretariat of the UNFCCC.[90] A browse through the texts of these country-specific reports on adaptation strategies reveals that 'technologies' are often cited.[91] There are general references to the use of technologies for adaptation, such as 'technology transfer for mitigation and adaptation',[92] 'use of the new technologies capable to guarantee adaptation to the era of climate change',[93] and a call on developed states to 'facilitate the transfer of needed technology and resources so that effective

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[85] CAF, note 26 above.
[86] UNFCCC, 'Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010', 15 March 2011, FCCC/CP/2010/7/Add.1, para 113.
[87] UNFCCC, 'National Adaptation Plans', http://unfccc.int/adaptation/workstreams/national_adaptation_plans/items/6057.php, last accessed on 22 July 2015.
[88] NAPAs, note 28 above.
[89] CAF, note 26 above.
[90] UNFCCC, 'NAPAs Received by the Secretariat', unfccc.int/adaptation/workstreams/national_adaptation_programmes_of_action/items/4585.php, last accessed on 22 July 2015.
[91] To establish this, I went through the 50 country reports and searched for the terms 'technology', 'technologies' and 'technological'. All of the NAPAS that are available include at least some references to these terms. Such a cursory search suggests merely that there is recognition of the value of technologies. What kinds of technologies, for what purposes, and with what intention they are used exactly cannot be recounted without a more detailed analysis of the reports. The main point to make here is that there is at least a superficial recognition that technologies are necessary for adaptation.
[92] Ministry of Environment and Forests Government of the People's Republic of Bangladesh, 'National Adaptation Programme of Action', June 2009, 1, http://unfccc.int/resource/docs/napa/ban02.pdf, last accessed on 22 July 2015.
[93] Republic of Sao Tome and Principe, 'National Adaptation Programmes of Action on Climate Change', December 2006, 17, http://unfccc.int/resource/docs/napa/stp01.pdf, last accessed on 22 July 2015.

adaptation can continue to take place'.[94] In several NAPA reports, there are specific references to technologies for agriculture. These include: 'use of appropriate technologies to achieve higher farm productivity, food security and farm income',[95] 'improving crop production through the use of appropriate technologies',[96] and 'use of technologies for fertility improvement'.[97] There are moreover some specific references to climate resilient crops, including: development of 'climate change resilient cropping systems',[98] 'introduction of new more productive agricultural varieties, with a wide spectrum of climate tolerance,'[99] 'introduc[ing] and scal[ing] up existing innovative technologies to deal with flood, drought and salinity',[100] and applying 'genetic improvement programs through introduction of drought-, salinity-, heat-, disease- and pest resistant/tolerant varieties/crops'.[101]

Looking at some of the international adaptation initiatives established by the UNFCCC, it can be said that there are plenty of references to 'technologies', and some of these references explicitly name technologies for agriculture. The adaptation initiatives stimulate the use of technologies more explicitly than the texts of the UNFCCC and the Kyoto Protocol. However, these initiatives and the country reports do not make explicit references to genetically engineered climate-resilient seeds. The next section will examine two reports that do expressly promote climate-ready seeds.

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[94] State of Eritrea, Ministry of Land, Water and Environment, Department of Environment, 'National Adaptation Programme of Action', April 2007, Preface v, http://unfccc.int/resource/docs/napa/eri01.pdf, last accessed on 22 July 2015.

[95] 'Afghanistan: National Capacity Needs Self-Assessment for Global Environmental Management (NCSA) and National Adaptation Programme of Action for Climate Change (NAPA)', Final Joint Report, February 2009, 34, http://unfccc.int/resource/docs/napa/afg01.pdf, last accessed on 22 July 2015.

[96] Republic of Malawi, 'Malawi's National Adaptation Programmes of Action', March 2006, 3, http://unfccc.int/resource/docs/napa/mwi01.pdf, last accessed on 22 July 2015. This is listed third on a list of 15 adaptation options, ranked in terms of priority.

[97] Ministry of Tourism Environment and Natural Resources of the Republic of Zambia, 'Formulation of the National Adaptation Programme of Action on Climate Change', September 2007, 20, http://unfccc.int/resource/docs/napa/zmb01.pdf, last accessed on 22 July 2015.

[98] Ibid.

[99] Republic of Sao Tome and Principe, 'National Adaptation Programmes of Action on Climate Change', December 2006, 17, http://unfccc.int/resource/docs/napa/stp01.pdf, last accessed on 22 July 2015.

[100] Ministry of Environment and Forests Government of the People's Republic of Bangladesh, 'National Adaptation Programme of Action', June 2009, 39, http://unfccc.int/resource/docs/napa/ban02.pdf, last accessed on 22 July 2015.

[101] Republic of Yemen, Environment Protection Authority, 'National Adaptation Programme of Action', 2009, 59, http://unfccc.int/resource/docs/napa/yem01.pdf, last accessed on 22 July 2015.

2.2.3 Promoting Agricultural Biotechnologies and Genetically Engineered Seeds

Two texts will be used in this examination, namely: 1) an IPCC Special Report from 2000 on technology transfer for responses to climate change;[102] and 2) a UNFCCC technical paper from 2006[103] – largely based on the foregoing report – that details the application of technologies for adaptation to climate change. The relevance and worth of each of these documents will be identified before proceeding to illustrating how they contribute to establishing a setting conducive to the development and use of climate-ready seeds as an adaptation strategy.

IPCC Special Report: 'Methodological and Technological Issues in Technology Transfer'

The IPCC is the main intergovernmental body that provides information about global climate change. The assessment reports, discussed briefly at the start of this chapter, provide up-to-date information about the state of climate change and the range of responses, both in terms of mitigation and of adaptation.[104] In addition to assessment reports, the IPCC also publishes special reports. These special reports focus on specific issues in relation to climate change. In 2000, the IPCC published a special report on 'Methodological and Technological Issues in Technology Transfer'. This report was prepared by Working Group III, dealing with responses to climate change, 'in response to a request by the Subsidiary Body for Scientific and Technological Advice (SBSTA) to the UNFCC'.[105] The foreword to this special report states that:

> Innovation and enhanced efforts to transfer environmentally sound technology to limit greenhouse gas emissions and to adapt to climate change will be required to meet the objective of the Climate Convention and to reduce vulnerability to climate change impacts.[106]

The IPCC special report of 2000 is directly relevant to narratives of climate-ready seeds, as it discusses the need for 'new technologies' for adaptation in the agricultural sector.[107] More explicitly, section 11.3.3 of this report is titled: 'Genetic Improvements Critical to Climate

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[102] Intergovernmental Panel on Climate Change, 'Methodological and Technological Issues in Technology Transfer – Special Report of Working Group III of the Intergovernmental Panel on Climate Change' in *IPCC Reports*, ed. Bert Metz et al. (Cambridge, UK: IPCC, 2000).
[103] Richard J.T. Klein et al., 'Application of Environmentally Sound Technologies for Adaptation to Climate Change, FCCC/TP/2006/2' *FCCC Technical Papers* (UNFCCC, 10 May 2006).
[104] See section 1.1.1 above.
[105] IPCC 2000, note 102 above, Foreword.
[106] Ibid.
[107] Ibid., Chapter 11 (Agricultural Sector), section 11.2.1 (Adaptation Technologies).

Adaptation'.[108] This section describes the need for genetic improvements in agriculture to increase production in the face of climate change, and notes that half of the increases in crop yields in recent years are attributable to 'genetic improvements in crop varieties'.[109] It also notes that: 'In the future, biotechnology may offer significant opportunities to address the need for crop adaptation to changing climate across all countries'.[110] Section 11.3.5 of the report discusses the growing role of the private sector in supplying the necessary biotechnology, stating that:

> An implication of the rise of private sector plant breeding is that new seed varieties so crucial to yield growth across the world will increasingly come from private companies demanding greater levels of IPR [intellectual property rights] protection. Developing countries will have to interact with an increasingly concentrated private agricultural (primarily seed) biotechnology industry. The private sector will thus become a more important vehicle for transferring modern crop varieties in the future.[111]

This special report contributes to filling the gaps left open in the international legal framework on adaptation. While the texts of the UNFCCC and the Kyoto Protocol do not provide any details on how adaptation to climate change should be executed and regulated, this IPCC special report endorses the use of agricultural biotechnologies, and specifically genetic engineering techniques, in adaptation strategies. Next will be an examination of a technical paper published by the UNFCCC which is based on this special report, and likewise advocates the use of genetic engineering.

UNFCCC Technical Paper: 'Application of Environmentally Sound Technologies for Adaptation to Climate Change'

The UNFCCC publishes so-called technical papers, many of which focus on responses to climate change in the form of new technologies and transfer of technology. Technical papers are commissioned by the secretariat of the UNFCCC and prepared by a group of experts in the field.[112] One technical paper will be examined here as it is relevant with regard to reinforcing the

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[108] Ibid.
[109] Ibid., section 11.3.3.
[110] Ibid., section 11.3.3.
[111] Ibid., section 11.3.5.
[112] The list of technical papers published by the UNFCCC until now can be found here: http://unfccc.int/documentation/documents/advanced_search/items/3594.php?symbol=%22/TP%22#beg, last accessed on 22 July 2015.

utility of technology for adaptation, and moreover specifically advocates the use of agricultural biotechnologies, genetic engineering, and climate-resilient crops.

The technical paper entitled 'Application of Environmentally Sound Technologies for Adaptation to Climate Change' was published in 2006 and provides an overview of available technologies that may be used in adapting to the present and future consequences of climate change.[113] The recommendations in this report serve as a basis upon which adaptation measures can be implemented in the international legal framework on climate change. This technical report is based on, and builds upon, the IPCC special report from 2000. An interesting preliminary observation to make is the authors' explicit recognition of the limitations of technologies. At paragraph 53, the authors write that '[t]he idea of using technology to solve or alleviate an adverse situation is deceptively appealing', and highlight that technology is only one part of the solution. This recognition reflects debates about 'technological fetishism' and overreliance on technological fixes to address climate and food problems, as highlighted in section 2.1 above. Notwithstanding an awareness of the limits of technology, the main argument of the paper is that 'many technologies exist to adapt to natural weather related hazards and that these technologies can also play an important part in reducing vulnerability to climate change'.[114] The essence of the paper's argument is that while it recognizes and acknowledges the limitations of technologies, they should nevertheless play a role in adapting to the impacts of climate change.

The advantage of employing biotechnologies in the quest to devise adaptation strategies to climate change impacts on agriculture has already been recognized in early climate change discourse. One of the first technical papers, for instance, mentions biotechnology in relation to seed development as a possible adaptation option.[115] Referring back to the first IPCC assessment report of 1996, the 2006 technical paper states that '[t]he ability of world agriculture to meet the needs of an ever expanding population has been due to the development and adoption of new technologies, rather than to the expansion of cultivated land'.[116]

The 2006 technical paper elaborates on the use of agricultural biotechnologies, explicitly naming 'genetically modified organisms'[117] and 'drought-resistant seeds'[118] as options in a range of agricultural biotechnologies that can contribute to adaptation, in paragraphs 58 and 55 respectively. Table 8 under paragraph 206 of the paper lists the conduction of 'research to

[113] Klein et al 2006, note 103 above.
[114] Ibid., in the Summary on the front page.
[115] Richard J.T. Klein and Richard S.J. Tol, 'Adaptation to Climate Change: Options and Technologies: An Overview Paper, FCCC/TP/1997/3' *FCCC Technical Papers* (UNFCCC, 9 October 1997), especially Box 3.2: 'Opportunities for biotechnology in seed development'.
[116] Klein et al 2006, note 103 above, para 193.
[117] Ibid., para 58.
[118] Ibid., para 55.

develop new crop varieties' as an example of 'adaptation opportunities vis-à-vis climate change impacts on agricultural systems'. Paragraphs 216 and 221 again mention biotechnology, and more specifically gene technology. Paragraph 216 states: '[T]o address adverse effects of global warming it is necessary to have a new generation of varieties. Breeding will continue to be important, but gene technology will help to speed up the process.'[119]

The subsequent paragraphs go on to predict that genetic improvements to crops 'are likely to play an even greater role' in the future, and that biotechnology 'may offer important opportunities to address the need for crop adaptation to changing climate across all countries'.[120] Even though the authors stated in a previous part of the paper that most of the technologies necessary for adaptation to climate change are already available and the main challenge is transfer of technologies,[121] the overall gist of the report seems to be that new genetic engineering technologies in agriculture are necessary.

2.3 BIOTECHNOLOGY, CLIMATE CHANGE ADAPTATION LAW, AND CLIMATE-READY SEEDS

The storyline of part 1 of this chapter was that there is increasing attention for the need to adapt to the already inevitable impacts of climate change, that this urgency is reflected in international climate change adaptation law and initiatives, and that climate-ready seeds are one proposed adaptation strategy. Part 2.1 of this chapter showed that serious debates exist about the value of technologies to address societal problems. These debates are reflected in contradictory narratives of climate-ready seeds that hold opposing views about relying on genetically engineered seeds to adapt to the impacts of climate change and combat climate-induced hunger.

As climate-ready seeds are a proposed adaptation strategy, and adaptation is regulated through the international legal framework on climate change, the exploration in this part of the chapter focused on what adaptation law prescribes about using technologies for adaptation. The texts of the UNFCCC and the Kyoto Protocol contain very broad references to technologies. These references suggest that technologies are considered valuable and necessary in adapting to the impacts of climate change, but they do not specify any type of adaptation. References to technologies in international adaptation initiatives and special reports focusing on adaptation technologies contain more explicit references to agricultural technologies and genetically

[119] Ibid., para 216.
[120] Ibid., paras 217 and 218.
[121] Ibid., especially paras 73 and 76.

engineered climate-resilient seeds. These initiatives and reports, although not legal texts, do contribute to creating a context in which the legal texts are interpreted.

The conclusion of this examination is that the international legal framework on climate change adaptation generally accepts the use of technologies in adaptation, and that discourse that feeds into this legal framework more explicitly promotes genetically engineered climate-resilient seeds and crops. The next part of this chapter will look into what adaptation law says about the role of the private sector, another big point of contention in narratives of climate-ready seeds.

3 THE ENGAGEMENT OF THE PRIVATE SECTOR IN CLIMATE CHANGE ADAPTATION

Within the international legal framework, States Parties hold the responsibility for, and obligation of, providing adaptation strategies. Nevertheless, private sector corporations, not states, are dominant in researching and developing climate-ready seeds.[122] This section will examine what international adaptation law says about the role of the private sector. First, the emergence of private authority will be discussed in general, and then specifically in the field of agricultural research. After that, references to private sector engagement in climate change adaptation law will be examined. The main argument in this part of the chapter is that international climate change adaptation law is increasingly welcoming to and enabling of private sector engagement.

3.1 THE EMERGENCE OF PRIVATE AUTHORITY

The texts of the UNFCCC and the Kyoto Protocol are directed at States Parties, and create obligations for states to take action to address the impacts of climate change. Even though public international law is formally still very state-centric, the influence of the private sector is increasingly evident. The emergence of private sector authority in global governance will first be explored here. Subsequently, the focus will turn to private sector influence on agricultural research for climate change adaptation.

[122] See: Chapter 1, section 3.2.

The 'emergence of private authority' is occurring throughout global governance.[123] States are no longer the only, or even the principal, holder of authority when it comes to addressing issues in society. As Rodney Hall and Thomas Biersteker write:

> We find it telling that at the beginning of the 21st century there are so many examples of sites or locations of authority that are neither states, nor state-based, nor state-created. The state is no longer the sole, or in some instances even the principal, source of authority, in either the domestic arena or in the international system.[124]

The term 'authority' alludes not only to the power to take action, but also and importantly to some form of merit and social acceptance, or legitimacy.[125] Hall and Biersteker refer to the ideas of Susan Strange, remarking that 'non-state actors … are increasingly acquiring power in the international political economy, and, to the extent that their power is not challenged, they are implicitly legitimated as authoritative'.[126]

In today's world, it is commonly accepted that states have to share power and authority with other actors, including private actors. Authors such as Saskia Sassen argue, however, that private authority should not be seen as entirely separate from the state. On the contrary, Sassen writes about the 'presence of private agendas inside the state'.[127] Instead of surrendering power to private authority, states incorporate private authority into their own strategies, resulting in interests of the private sector being presented as part of the public strategy. Similar to the perception of usefulness of technological solutions discussed in the previous part of this chapter, the legitimacy and authority afforded to private actors in global governance is often criticized. Growing private sector authority and critiques of this development form the backdrop for the discussion on the role of adaptation law in inviting and enabling private sector engagement.

Private sector influence is visible in the development of climate-ready seeds, as the vast majority of such seeds are developed by large private seed corporations.[128] Part of the underlying cause for private sector dominance in agricultural research is the recent drastic decline in public

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123 Thomas J. Biersteker and Rodney Bruce Hall (eds), *The Emergence of Private Authority in Global Governance*, Cambridge Studies in International Relations (Cambridge: Cambridge University Press, 2002).
124 Ibid., 5.
125 Ibid., at Chapter 1.
126 Ibid., 6.
127 Saskia Sassen, 'The State and Globalization' in *The Emergence of Private Authority in Global Governance*, ed. Rodney Bruce Hall and Thomas J. Biersteker (Cambridge, UK; New York: Cambridge University Press, 2002), 91.
128 Private sector dominance in the development of climate-ready seeds is especially evident in the proportion of patent applicants on these seeds and technologies by private sector corporations. This is estimated by the ETC Group at 90 per cent, as opposed to 10 per cent of patent applications from the public sector. See Chapter 1 at note 169.

funding for agricultural research. For instance, the OECD, as reported by Oxfam International, estimated in 2013 that there had been a 40 per cent drop in funding for climate change adaptation between 2010 and 2011.[129] These funds were mainly intended to help developing countries adapt to the consequences of climate change.[130] Where government investments in agricultural research have dwindled, private corporations are expanding their investments in research and development of new agricultural technologies. The predicted severe adverse effects of climate change on agriculture add to the sense of urgency to invest in agricultural research for the purpose of adapting to these effects. However, narratives of climate-ready seeds show a great deal of contention and disagreement regarding the dominant role of the private sector.[131] Critics of climate-ready seeds as tools to adapt to climate change and combat hunger argue that seed corporations are interested more in their own profit than in 'feeding the world'. David Waskow, former Oxfam International's Climate Change Policy Lead, has stated that '[g]overnments can't leave it up to the private sector to fill this enormous adaptation funding shortfall'.[132] The reason for this statement is that the primary incentive of private sector corporations is profit, not helping the world adapt to the impacts of climate change.[133]

Taking into account these criticisms, the question that will be examined here is what role climate change adaptation law plays in accepting or even promoting private sector engagement. The argument that will be made is that adaptation law contributes to creating a favourable environment that invites and enables private sector involvement in adaptation strategies.

3.2 LAW'S INVITATION TO PRIVATE SECTOR ENGAGEMENT IN ADAPTATION

Considering that climate-ready seeds are presented as a possible adaptation strategy to climate change, what does international adaptation law suggest about the role of private corporations? Even though international climate change adaptation law is directed at States Parties, documents and discourse related to the legal texts of the UNFCCC and the Kyoto Protocol increasingly recognize the value of private sector engagement. As with the examination of technology in

[129] Oxfam International, '40 Per Cent Drop in Climate Change Adaptation Funding Must Prompt Action at Key Meetings Next Week', http://www.oxfam.org/en/grow/pressroom/pressrelease/2013-04-03/40-cent-drop-climate-change-adaptation-funding-must-prompt-action, last accessed on 22 July 2015. An overview of the public funding per sector per country can be found here: http://stats.oecd.org/Index.aspx?DataSetCode=RIOMARKERS, last accessed on 22 July 2015.
[130] Ibid.
[131] See, for an overview of narratives of climate-ready seeds, Chapter 1, section 3.3.
[132] Oxfam International, note 129 above.
[133] Waskow stated that: 'The private sector have mostly stayed away from funding some of the most important adaptation programs – which help people gain access to the water, food and basic services diminished by climate change – since they offer little or no short-term return on investment.' Ibid.

adaptation, this section will first study international legal texts before turning to related documents.

In the words of Roda Verheyen, the UNFCCC and the Kyoto Protocol govern 'only public adaptation measures and [do] not prescribe any particular activities by private entities'.[134] The text of the UNFCCC does not once mention the word 'private'.[135] The Kyoto Protocol mentions the private sector or private entities on two occasions. Article 10(c) states that parties shall cooperate in the 'creation of an *enabling environment for the private sector*, to promote and enhance the transfer of, and access to, environmentally sound technologies'.[136] Article 12(9) specifies that private entities may be involved, along with public ones, in formulating and implementing the clean development mechanism as a mitigation strategy.[137] These scarce references to private entities in the Kyoto Protocol do not impose obligations on the private sector, but rather obligations for the public sector to *enable* and *involve* the private sector where necessary. Article 10(c) is especially relevant to climate-ready seeds, as it relates directly to 'technologies'. However, not much can be deduced about the role of the private sector in adaptation from these limited references alone. When delineating international climate change adaptation law in the first part of this chapter, it was noted that it is not limited to the texts of the UNFCCC and the Kyoto Protocol, but includes and is greatly influenced by reports, papers, literature, and discourse originating in the broader climate change regime. Whereas the legal texts hardly mention private sector engagement, this supporting literature progressively calls upon and enables private sector parties to be involved in adaptation.

Christiana Figueres, Executive Secretary of the UNFCCC, has stated that '[a]daptation to climate change is no longer the exclusive ambit of the public sector'.[138] Adaptation initiatives introduced at the international level reinforce this perspective. In article 34, the Cancun Adaptation Framework explicitly invites a large number of stakeholders, including the private sector, to undertake and support action on climate change adaptation.[139] The Nairobi Work Programme has moreover launched the Private Sector Initiative (PSI) in 2011/2012, which:

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[134] Verheyen, note 49 above, 132.
[135] Neither does it use the words 'business' or 'corporation'; private entities are excluded entirely from the text.
[136] Kyoto Protocol. Emphasis added.
[137] Kyoto Protocol, article 12(9): 'Participation under the clean development mechanism, including in activities mentioned in paragraph 3 (a) above and in the acquisition of certified emission reductions, may involve private and/or public entities, and is to be subject to whatever guidance may be provided by the executive board of the clean development mechanism.'
[138] Pricewaterhousecoopers LLP, 'Business Leadership on Climate Change Adaptation: Encouraging Engagement and Action' (London: PricewaterhouseCoopers, December 2010), 3, http://www.pwc.co.uk/sustainability-climate-change/publications/adapting-to-climate-change.jhtml, last accessed on 22 July 2015.
[139] Cancun Adaptation Framework 2010, article 34: '*Invites* relevant multilateral, international, regional and national organizations, the public and private sectors, civil society and other relevant stakeholders to undertake and support

> [A]ims to catalyze the involvement of the private sector in the wider adaptation community. The unique expertise of the private sector, its capacity to innovate and produce new technologies for adaptation, and its financial leverage can form an important part of the multi-sectoral partnership that is required between governmental, private and non-governmental actors.[140]

The PSI invites private sector parties to submit case studies showcasing how they are engaging with, and adapting to, climate change. These case studies include examples of adaptation strategies for agricultural crops, submitted by some of the large agricultural biotechnology corporations. The following is an overview of the private adaptation initiatives included in the PSI database that involve genetically engineered crops. [141]

- BASF submitted an initiative with the title 'New technologies for climate change adaptation'.[142] It is aimed at improving food security by providing an adaptation strategy for the agricultural sector. It mentions the development of stress-tolerant plants. (No date is specified for this initiative.)
- Bayer submitted an initiative under the name 'Developing stress-tolerant plants'.[143] The focus area of this initiative is Europe. In this submitted case study, Bayer highlights the growing demand for food and the strain on resources. It advertises Bayer's contribution to developing adaptation technologies for the agricultural sector. (No date is specified for this initiative.)
- BASF, in collaboration with Monsanto, submitted an initiative named 'Help crops adapt to changing climates' in 2012.[144] It focuses on research and development of drought-tolerant maize as an adaptation strategy to climate change.

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enhanced action on adaptation at all levels, including under the Cancun Adaptation Framework, as appropriate, in a coherent and integrated manner, building on synergies among activities and processes, and to make information available on the progress made.'

[140] NWP, note 27 above.

[141] See, for the complete database so far: UNFCCC, 'Private Sector Initiative - Database of Actions on Adaptation', http://unfccc.int/adaptation/workstreams/nairobi_work_programme/items/6547.php, last accessed on 22 July 2015.

[142] UNFCCC Private Sector Initiative - Actions on Adaptation: BASF, 'New Technologies for Climate Change Adaptation', http://unfccc.int/files/adaptation/nairobi_work_programme/private_sector_initiative/application/pdf/basf.pdf, last accessed on 22 July 2015.

[143] UNFCCC Private Sector Initiative - Actions on Adaptation: Bayer, 'Developing Stress-Tolerant Plants', http://unfccc.int/files/adaptation/nairobi_work_programme/private_sector_initiative/application/pdf/bayer.pdf, last accessed on 22 July 2015.

[144] UNFCCC Private Sector Initiative - Actions on Adaptation: BASF, 'Help Crops Adapt to Changing Climates', 19 December 2012,

- Bayer submitted an adaptation initiative entitled 'Provide seed treatment for more efficient resources use' in 2012.[145] It briefly describes two technologies that are in the pipeline, one of which is the development of stress-tolerant crops.
- In 2013, Syngenta submitted an initiative called 'Boosting crop yield for every drop of water'.[146] The description includes the slogan 'grow more from less' and highlights the company's efforts in developing drought-tolerant crops.

The PSI, an adaptation initiative under the auspices of the UNFCCC, does not make a judgement about the necessity of private adaptation initiatives included in its database. However, it does provide a platform for the private sector to present its own schemes, and engage in adaptation.

A browse through the National Adaptation Programmes of Action, submitted by least developed countries to the UNFCCC, is also illustrative of the invitation extended to the private sector. Many NAPAs name the private sector as a stakeholder in the process of adapting to the impacts of climate change.[147] For instance, the following references are made in NAPAs: 'private sector development' is one way in which to create an 'enabling framework for successful implementation of NAPA projects',[148] 'government, non-government and private institutions that should contribute to the implementation of the NAPA project',[149] part of the implementation strategy of the NAPA is for 'government to encourage and promote the involvement of the private sector',[150] and 'the NAPA team comprised of experts from various

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http://unfccc.int/files/adaptation/nairobi_work_programme/private_sector_initiative/application/pdf/basf.wbcsd.pdf, last accessed on 22 July 2015.

[145] UNFCCC Private Sector Initiative - Actions on Adaptation: Bayer, 'Provide Seed Treatment for More Efficient Resources Use', 19 December 2012, http://unfccc.int/files/adaptation/nairobi_work_programme/private_sector_initiative/application/pdf/bayer_cropscience.wbcsd.pdf, last accessed on 22 July 2015.

[146] UNFCCC Private Sector Initiative - Actions on Adaptation: Syngenta, 'Boosting Crop Yield for Every Drop of Water', 5 February 2013, http://unfccc.int/files/adaptation/nairobi_work_programme/private_sector_initiative/application/pdf/syngenta.wbcsd.pdf, last accessed on 22 July 2015.

[147] This has been established by searching for the terms 'private' and 'private sector' in the NAPAs submitted to the UNFCCC.

[148] Lesotho Ministry of Natural Resources and Lesotho Meteorological Services, 'Lesotho's National Adaptation Programme of Action', June 2007, section 6.3, http://unfccc.int/resource/docs/napa/lso01.pdf, last accessed on 22 July 2015.

[149] Republic of Cape Verde, Ministry of Environment and Agriculture, 'National Adaptation Programme of Action on Climate Change', November 2007, 17, http://unfccc.int/resource/docs/napa/cpv01.pdf, last accessed on 22 July 2015.

[150] Government of Sierra Leone, Ministry of Transport and Aviation, 'National Adaptation Programme of Action (NAPA)', December 2007, 52, http://unfccc.int/resource/docs/napa/sle01.pdf, last accessed on 22 July 2015.

government institutions … and private institutions and NGOs'.[151] Angola's NAPA mentions the 'lack of involvement by the private sector in questions related to climate change' as a 'potential barrier to implementation' of adaptation policy.[152] While the text of the UNFCCC makes no mention of the private sector, adaptation initiatives introduced under its umbrella create a welcoming and enabling environment for private sector engagement in adaptation.

The IPCC special report and the UNFCCC technical paper, discussed in relation to adaptation technologies in part 2, also allude to private sector engagement. In paragraphs 69 and 436, the special report mentions the need to 'stimulate private sector investment' in various adaptation options. Paragraph 130 states that the private sector can extend its role in adaptation 'when provided with the right incentives'. Paragraphs 230 and 231 subsequently address the inadequacy of intellectual property protection for plants as barriers to incentivizing private sector investments. Finally, paragraph 317 states that '[i]ncorporation of the private sector, identified as an important source of funding, should be a major focus of efforts aimed at the transfer of technologies'.[153] The UNFCCC technical paper underscores some of the same points. Namely, section 11.3.4 of this paper mentions the lack of intellectual property protection for plants as a potential limitation to private sector investments.[154] Moreover, the same paper predicts a growing role of the private sector and genetically engineered crops in the future.[155]

The main argument here is that, even though international climate change adaptation law is not directed at the private sector and does not create obligations for the private sector, private authority has almost unnoticeably become part of adaptation policy. Adaptation initiatives, reports, and papers published with the backing of the UNFCCC and the IPCC in a subtle but indisputable way incorporate the private sector into the adaptation regime. The argument is not that international law stipulates or requires private sector engagement, but rather that it contributes to creating an enabling environment to this end. In this regard, it was necessary to look not only at the treaties, but also at the circumstances in which they apply. The logic of law is created by the legal regime that extends beyond the texts of the treaties, and serves to explain the meaning of those texts. The international legal regime on climate change adaptation thereby

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[151] United Republic of Tanzania, 'National Adaptation Programme of Action (NAPA), January 2007, 3, http://unfccc.int/resource/docs/napa/tza01.pdf, last accessed on 22 July 2015.

[152] Angola, 'National Adaptation Programme of Action', 2011, 65, http://unfccc.int/resource/docs/napa/ago01.pdf), last accessed on 22 July 2015.

[153] IPCC 2000, note 102 above.

[154] Under the heading 'Growing role of the private sector', the authors of the report write that: 'Genetic resources are easily transported and replicated, making it difficult for a country or individual to exclude others from their use. This discourages private actors from making investments to preserve and collect genetic resources and to screen them for their potential usefulness.' Klein et al. 2006, note 103 above, section 11.3.4.

[155] Ibid, section 11.3.5 under 'Growing role of the private sector'.

contributes to extending an invitation to private sector actors to participate actively in developing and employing adaptation strategies.

CONCLUSION

It has become increasingly evident in recent years that there is a need to adapt to those impacts of climate change that are already imminent, and for which mitigation action comes too late. While climate change strategies initially focused almost exclusively on mitigation, equal, if not more, attention is now given to adaptation. Looking back at the three approaches to adaptation discussed in the first part of this chapter, it can be concluded that the realist approach, which accepts that positive actions must be taken against climate change impacts, has become dominant. Agriculture is one of the sectors predicted to be most severely affected by climate change. One of the most detrimental climate change impacts is on crop yields: changes in average temperatures and precipitation levels will diminish crop yields or even lead to complete harvest failures. Genetically engineered, 'climate-resilient' seeds are presented as one possible adaptation strategy to address declining crop yields, and ultimately to combat hunger in the face of climate change.

The aim of this chapter has been to examine the role that international climate change adaptation law plays in singling out climate-ready seeds as a possible adaptation strategies. The UNFCCC and the Kyoto Protocol are the two international treaties that regulate climate change strategies. They govern both mitigation and adaptation. However, the texts of these treaties are very broad and open-ended, leaving a great deal of space for delineating the contours of adaptation actions. Therefore, in this chapter, the legal regime of climate change adaptation was understood to include also adaptation initiatives, reports, papers, and other documents and discourse originating from the UNFCCC and the IPCC, as the main institutions governing climate change policy internationally. This international legal framework of climate change adaptation was examined for its relevance in narratives of climate-ready seeds.

The central argument made in this chapter is that despite contentions related to reliance on biotechnologies and dominance of the private sector, international climate change adaptation law is party to creating an environment that is in favour of the use of agricultural biotechnologies, and moreover invites private sector engagement in adaptation. The next chapter will focus on one of the biggest points of contention in contradictory narratives of climate-ready

seeds, namely the rising patent applications by corporations on these seeds. Chapter 3 will examine especially what the role is of intellectual property law in dealing with this contention.

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3. INTELLECTUAL PROPERTY RIGHTS AND CLIMATE-READY SEEDS

INTRODUCTION

The previous chapter showed that international climate change adaptation law contributes to promoting genetically engineered seeds as an adaptation strategy and creating an enabling environment for the private sector to be actively engaged in adaptation strategies. Some of the biggest debates in narratives of climate-ready seeds centre on the rising patent right applications by private sector seed corporations. This chapter will explore how international intellectual property law is relevant in different narratives of climate-ready seeds.

The first part will explain how plants came to be considered patentable subject-matter. Which developments in history enabled this outcome, and what justifications lie at the base of it? It will also expound some of the broader issues surrounding genetic engineering and intellectual property rights. The second part will look specifically at discussions of patent rights on climate-ready seeds. How is international patent law employed in different narratives of climate-ready seeds? Finally, the third part will explore other forms of proprietary rights – namely sovereign rights over natural resources and farmers' rights – and how these rights are invoked by critical NGOs to counter what they consider to be the monopolizing effects of corporate patent rights.

The main argument in this chapter is that criticisms of climate-ready seeds focus a lot of attention on corporate patent rights, leaving other questions about plants as patentable subject-matter and patents as incentives for innovation in the background. This argument will be elaborated further in the analysis in Chapter 5.

1 PLANTS AS SUBJECT-MATTER OF INTELLECTUAL PROPERTY PROTECTION: A CONTENTIOUS HISTORY

The first part of the chapter will set out the context in which plants and seeds came to be perceived as admissible subject-matter of patent rights. It will first present the emergence of intellectual property protection for plants, followed by an overview of some of the main controversies related to patenting plants.

1.1 PLANT GENETIC RESOURCES AS SUBJECTS OF INTELLECTUAL PROPERTY PROTECTION

Intellectual property law includes a wide range of rights, and patent rights are the most relevant and controversial in discussions about plants and other living organisms. One of the fundamental requirements of patent law is that the patentable subject-matter must be 'new' and 'involve an inventive step'.[1] The intellectual property to which a patent right is applied must, in other words, be an invention and not a discovery of something that already existed. For this reason, living things, including plants, were not considered patentable subject-matter for most of the history of intellectual property protection.[2] So how did climate-ready seeds come to be subject to patent rights? Advancements in biotechnology allowed for the ability to alter the genetic make-up of living things, and have contributed significantly to blurring the lines between 'discovery' and 'invention', between what is found in nature and what is manmade.[3] To provide a backdrop for the increasing patent applications on climate-ready seeds, this section will briefly explore how plants came to be regarded as patentable subject-matter.

The beginning of intellectual property protection for plants began in domestic legislation. The United States was the scene for early history of forms of intellectual property rights applied to plants. The Plant Patent Act (PVA)[4] passed by the US Congress in 1930 was 'the first intellectual property rights regime for plants anywhere in the world'.[5] Whereas the PVA provided protection only to asexually reproducing plants, the later Plant Variety Protection Act (PVPA) of 1970[6] granted patent protection to all types of plant varieties. Similar developments in intellectual property law were taking place in Europe. The Union for the Protection of New Varieties of Plants (UPOV, the acronym of the Union's French name) was created in 1960, and the first

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[1] Article 27.1 of the Agreement on Trade-Related Aspects of Intellectual Property (TRIPS) defines 'patentable subject-matter'. Note 20 below.

[2] One of the earliest predecessors of modern intellectual property rights can be found in 16th century England. The English Crown granted temporary exclusive monopoly privileges to authors and inventors to stimulate innovations and industrial production. Brad Sherman and Lionel Bently refer to 'Royal Charters and Royal Letters of Patent of the Crown' as the foundation for patent law. Brad Sherman and Lionel Bently, *The Making of Modern Intellectual Property Law: The British Experience, 1760-1911*, Cambridge Studies in Intellectual Property Rights (Cambridge; New York: Cambridge University Press, 1999), 209, note 12. Despite this long history of intellectual property protection, the first legal instrument that allowed patent rights on living things was the 1930 Plant Patent Act passed by the US Congress. See: Fowler at note 4 below.

[3] European Patent Office, 'Patents on Biotechnology', http://www.epo.org/news-issues/issues/biotechnology.html, last accessed on 22 July 2015.

[4] Cary Fowler, 'The Plant Patent Act of 1930: A Sociological History of its Creation' 82 *Journal of the Patent and Trademark Office Society*, 621.

[5] Anthony J. Stenson and Tim Gray, *The Politics of Genetic Resource Control* (New York; Basingstoke: St. Martin's Press; Macmillan, 1999), 10-11.

[6] B. Erker and M.A. Brick 'The Plant Variety Protection Act', Colorado State University, fact sheet no. 0.301, November 2014, http://www.ext.colostate.edu/pubs/crops/00301.html, last accessed on 22 July 2015.

UPOV Convention came into being in 1961.[7] It stipulated the concept of plant variety rights (PVRs) or plant breeders' rights (PBRs),[8] a type of intellectual property protection designed specifically for breeders developing new varieties of plants.

PVRs were originally weaker forms of rights than patents. The 1961 UPOV Convention contained a breeders' exemption and a farmers' exemption. The former allowed breeders to use protected varieties to research and develop new varieties, without authorization from the rights-holders.[9] The latter allowed the private, non-commercial use of protected varieties by farmers, mainly for subsistence farming.[10] These exemptions have, however, become severely restricted in later UPOV Conventions of 1978 and 1991, making plant breeders' rights very similar in scope to patent rights.[11] These legal texts in the US and Europe are early recognitions of the fact that plants and breeding techniques can be subject to intellectual property protection.

In addition to domestic and regional legal texts providing for forms of intellectual property protection for plants, two landmark decisions in the US gave a tremendous stimulus to the acceptance of plants as patentable subject-matter. In 1980, the US Supreme Court decided on the case of *Diamond vs. Chakrabarty*.[12] In this case, the Supreme Court overturned a decision by a patent examiner who rejected a patent application on a genetically engineered bacterium. The main ground for rejection was that bacteria are living things that were generally understood not to be patentable under US law. The Supreme Court, however, held that 'the relevant distinction was not between living and inanimate things, but between products of nature, whether living or not, and human-made inventions'.[13] The Supreme Court found that the bacterium was patentable because it was genetically engineered by man, thereby making it a 'manufacture'. The judges argued that the patent application was 'not to a hitherto unknown natural phenomenon, but to a nonnaturally occurring manufacture or composition of matter'.[14]

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[7] International Union for the Protection of New Varieties of Plants, http://www.upov.int/portal/index.html.en, last accessed on 22 July 2015. The latest UPOV Convention is from March 1991. See: International Convention for the Protection of New Varieties of Plants, http://www.upov.int/en/publications/conventions/1991/act1991.htm, last accessed on 22 July 2015.

[8] The UPOV Convention 1991 refers to 'breeders' rights', see article 1(v). The terms 'plant variety rights' and 'plant breeders' rights' refer to the same concept. The former emphasizes the value of the plant variety, the latter emphasizes the labour of the breeders. Note 7 above.

[9] Article 15(1)(iii) UPOV Convention 1991. Note 7 above.

[10] Laurence R. Helfer and Food and Agriculture Organization of the United Nations, *Intellectual Property Rights in Plant Varieties: International Legal Regimes and Policy Options for National Governments*, FAO Legislative Study (Rome: FAO, 2004), 25-28.

[11] Ibid.

[12] Diamond, Commissioner of Patents and Trademarks v. Chakrabarty, 447 U.S. 303, 308-9 (1980). See also: Brian D. Wright and Philip G. Pardey, 'The Evolving Rights to Intellectual Property Protection in the Agricultural Biosciences' *International Journal of Technology and Globalisation* 2 (1/2) (2006), 16.

[13] Diamond v. Chakrabarty, note 12 above, 314. See also: http://caselaw.findlaw.com/us-supreme-court/447/303.html, last accessed on 22 July 2015.

[14] Ibid., 308.

One of the judges in this case famously made a reference to the statement that 'anything under the sun that is made by man' is patentable.[15] In *Ex Parte Hibberd*,[16] a 1985 decision by the US Patent and Trademark Office (USPTO), the *Chakrabarty* case was confirmed and expanded on. The *Ex Parte Hibberd* case involved maize plant technologies, and the USPTO overturned a rejection of a patent application on maize seeds by the patent examiner.[17] The USPTO rejected the idea that 'artificially bred' plants are 'products of nature not subject to patent protection'.[18] Although these cases are considered groundbreaking in deeming plants to be patentable subject-matter, they were judged under US domestic law.

By far the most significant piece of legislation that marked a turning point in the international legal protection of plant genetic resources is the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), an annex to the agreement establishing the World Trade Organization (WTO) that came into force in 1994.[19] Article 27.3(b) TRIPS stipulates that States Parties:

> [M]ay exclude from patentability … plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof.[20]

The latter sentence effectively requires states to apply either patent rights or another form of intellectual property protection (such as plant breeders' rights under the UPOV) to plant varieties. The text of article 27.3(b) arose in the context of great conflict, particularly between the developed countries (notably the US and the EU) and developing countries. The US and the EU are considered 'technology exporters', and their concern lies in protecting the interests of biotechnology corporations that act as strong lobby groups and benefit from intellectual

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[15] Ibid., 310.
[16] Ex Parte Hibberd, 227 U.S.PQ. 443 (Bd. Pat. App. & Int. 1985).
[17] Ibid. See also: The United States Patent and Trademark Office. '2105 Patentable Subject Matter – Living Subject Matter [R-08.2012]', http://www.uspto.gov/web/offices/pac/mpep/s2105.html, at the bottom of the webpage, last accessed on 22 July 2015.
[18] Ex Parte Hibberd, note 16 above. For the full text, see: http://www.iplawusa.com/resources/227_USPQ_443.pdf, at *9, last accessed on 22 July 2015.
[19] Agreement on Trade-Related Aspects of Intellectual Property Rights, 15 April 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, in *The Legal Texts: The Results of the Uruguay Round of Multilateral Trade Negotiations* 1869 U.N.T.S. 299; 33 I.L.M. 1197, 1994.
[20] Ibid. Plant variety protection as stipulated in the UPOV Convention is an example of a *sui generis* system.

property protection.[21] Developing countries are exporters of biological resources and importers of innovation; while the developed countries are granted patent rights for innovations, developing countries are not granted similar protection to compensate their exports of biological resources.[22] Despite the controversies surrounding this stipulation,[23] the adoption of TRIPS has, in the words of Laurence Helfer, 'done more to encourage the legal protection of plant varieties than any other international instrument'.[24]

The emergence of the legislation that allows the application of intellectual property rights to plants has influenced the development and patenting of climate-ready seeds. At the same time, there remains a great deal of disagreement on patenting plants and other living organisms. The next section will elaborate on some of the main positions related to genetic engineering in plants and intellectual property protection.

1.2 Controversies over Genetically Engineered Plants and their Patenting

Discord in narratives of climate-ready seeds with regard to patent applications are set within a number of broader conflicts relating to genetic engineering techniques for plants, the scope of patentable subject-matter, and justification theories for intellectual property protection. The TRIPS Agreement requires states to provide legal protection for plant varieties either through patents or a *sui generis* form of proprietary protection. Every party to the WTO is also a member of TRIPS, hence this stipulation has a wide application in 160 member states to date.[25] Article 27.3(b) TRIPS has opened the way for the application of patent rights on (genetically engineered) plant varieties, and has at the same time initiated serious criticisms. Two important issues will be discussed here, namely: whether plants and other living organisms should be genetically engineered and deemed patentable subject-matter; and whether intellectual property protection

[21] John Linarelli, 'TRIPS, Biotechnology and the Public Domain: What Role will World Trade Law Play?' in *Agriculture and International Trade: Law, Policy, and the WTO*, 193-214, ed. Michael N. Cardwell, Margaret R. Grossman, and Christopher P. Rodgers (Oxon, UK: CABI Publishing 2003), 197.
[22] Ibid., 197.
[23] For more information about the controversies related to article 27.3(b), see: Genetic Resources Action International (GRAIN), 'For a Full Review of TRIPS 27.3(B) an Update on Where Developing Countries Stand with the Push to Patent Life at WTO', March 2000, http://www.grain.org/article/entries/39-for-a-full-review-of-trips-27-3-b, last accessed on 22 July 2015.
[24] Laurence R. Helfer, 'Regime Shifting: The TRIPS Agreement and New Dynamics of International Intellectual Property Lawmaking' *Yale Journal of International Law* 29 (2004), 33.
[25] World Trade Organization, 'Members and Observers', http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm, last accessed on 22 July 2015.

really incentivizes innovation and leads to progress. These issues reflect contentions within the neoliberal food regime, as set out in Chapter 1 of this thesis.[26]

Should genetically engineered plants be considered patentable subject matter?

The growing of genetically engineered crops is until now concentrated in five countries, with four types of crops, and two main traits.[27] There is, however, evidence of increasing use of genetically engineered crops worldwide,[28] and this is coupled with a growing number of patent applications.[29] Notwithstanding this rise, there is a great deal of resistance against the use of genetically engineered crops, and particularly against corporate domination of genetically engineered seeds through patents. Arguments are often made that these seed corporations concentrate on commercially viable crops,[30] and not necessarily on those crops that are used by farmers in developing countries.[31] In an article about biotechnology and hunger that discusses the problem of private control over plant genetic resources, the journalist cites Ethiopian plant ecologist Tewolde Berhan Gebre Egziabher as saying the following:

> It's not the nature of genetic engineering itself that's the problem; it is the way genetic engineering has evolved. Early on, it came under the control of the private sector and is now being developed almost solely by that sector. By definition, the private sector's goal

[26] See sections 2.2 and 2.3 of Chapter 1, discussing the features of the neoliberal food regime and food sovereignty movements as depictions of tensions within this regime.

[27] Nature, 'GM Crops: A Story in Numbers', in 'GM Crops: Promise and Reality' *Nature* 497, Special Edition (2 May 2013), 22-23. Most genetically engineered crops are grown in the United States, Brazil, Argentina, Canada, and India. In 2012, nearly all genetically engineered crops were soya, maize cotton, and granola. The most popular genetically engineered traits are herbicide tolerance and insect resistance. See also: ISAAA, 'Global Status of Commercialized Biotech/GM Crops: 2014' Brief 49-2014: Executive Summary, http://www.isaaa.org/resources/publications/briefs/49/executivesummary/default.asp, last accessed on 22 July 2015. Table 1 of this report shows the 'Global Area of Biotech Crops in 2014'. In addition to the five top countries, countries such as Bangladesh, Vietnam, and Indonesia are also starting to introduce genetically engineered crops.

[28] ISAAA 2014, note 27 above.

[29] For instance, about 2,000 patent applications were applied for in Europe on genetically engineered crops, mostly by the largest seed corporations. ASEED Europe, 'GMO Patents Held by Bayer and BASF', 21 October 2013, http://aseed.net/en/gmo-patents-held-by-bayer-and-basf, last accessed on 22 July 2015. In China, patent applications on genetically engineered crops is also increasing. SciDev.Net, 'China's Agricultural Patents on the Rise', 2 March 2010, http://www.scidev.net/global/farming/news/china-s-agricultural-patents-on-the-rise.html, last accessed on 22 July 2015.

[30] Nature 2013, note 27 above: the four most grown genetically engineered crops are commercially viable.

[31] Crops that are 'under-researched and underfunded due to their limited importance in the global market' are often referred to as 'orphan crops'. Despite their relative lack of commercial value, orphan crops can be extremely important in local food production, particularly in the face of climate change. See, for example: Kebebew Assefa, 'The Dire Need to Support "Orphan Crop" Research' SciDev.Net, 27 January 2014, http://www.scidev.net/global/agriculture/opinion/the-dire-need-to-support-orphan-crop-research.html, last accessed on 22 July 2015.

> is to make money. It will not focus its attention on the needs of the poor, except as a way to sell its products.[32]

There also exists controversy about applying patent rights on genetically engineered crops, as made possible especially by article 27.3(b) of TRIPS. A particular concern is voiced by developing countries, whose territories contain most of the world's genetic resources. These countries consider it highly unfair that developed countries – mostly through seed corporations supported by developed country governments – are able to apply for exclusive patent rights on seeds and crops that have been genetically engineered using plant genetic resources as their raw material. Developing countries do not receive similar benefits from offering these genetic resources.[33]

'No patents on life!' and 'no patents on seeds!' are popular slogans that signal resistance to subjecting plants and living things to intellectual property protection.[34] The coalition of 'No Patents on Seeds!' has recently published an appeal to European governments to stop the application of patent rights on genetically engineered food crops.[35] A spokesperson for the coalition has stated that:

> Farmers, food producers and consumers will be severely impacted by the negative consequences. Patents on plants and animals give corporations the power to decide what is grown in the fields and which price we all have to pay for it.[36]

The contemporary debate on the legal treatment of plant genetic resources has been referred to as 'Seed Wars'. This term was first used in a 1984 *Wall Street Journal* report. Keith Aoki and Jack

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[32] Marilyn Berlin Snell, 'Against the Grain: Why Poor Nations Would Lose in a Biotech War on Hunger' *Sierra Magazine – Sierra Club*, July/August 2001.
[33] Linarelli, notes 21 and 22 above.
[34] See, for example: Rebecca Charnas, '"No Patents on Life" Working Group Update', http://www.councilforresponsiblegenetics.org/ViewPage.aspx?pageId=169, last accessed on 22 July 2015; SWISSAID, 'No Patents on Life!', http://www.swissaid.ch/en/no_patents_on_life, last accessed on 22 July 2015; and The International Coalition of 'No Patents on Seeds', 'Stop Patents on Plants and Animals!', http://no-patents-on-seeds.org/, last accessed on 22 July 2015.
[35] No Patents on Seeds!, 'Monsanto soon to receive 30 European patents on food plants: Coalition of No Patents on Seeds! publishes appeal to European governments', 21 May 2015, https://no-patents-on-seeds.org/en/information/news/monsanto-soon-receive-30-european-patents-food-plants, last accessed on 22 July 2015.
[36] Ibid.

Kloppenburg have written extensively about seed wars, articulating the controversies over intellectual property protection on seeds.[37] Kloppenburg and Kleinman have written that:

> If plant agriculture is one of the material foundations of society, the seed is the material foundation of plant agriculture. As such, plant germplasm – the genetic information encoded in the seed – is a resource of tremendous value. … access to, control over, and preservation of plant genetic resources have now emerged as fields of international concern and conflict.[38]

Seed wars refer to this conflict over access to, control over, and preservation of plant genetic resources. Vandana Shiva of Navdanya has argued that '[t]he only reason crops have been genetically engineered is to take patents on seeds, and collect royalties'.[39] This leads to the question of the aims and the justification for applying intellectual property protection to (genetically engineered) crops.

Does intellectual property protection incentivize innovation and lead to progress?

A dominant theory of justification for granting intellectual property protection is a utilitarian theory, according to which the ultimate rationale of (intellectual) property protection is 'maximization of net social welfare'.[40] William Fisher writes that:

> Pursuit of that end in the context of intellectual property, it is generally thought, requires lawmakers to strike an optimal balance between, on one hand, the power of exclusive rights to stimulate the creation of inventions and works of art and, on the other, the partially offsetting tendency of such rights to curtail widespread public enjoyment of those creations.[41]

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[37] See, especially: Jack Kloppenburg Jr. and Daniel Lee Kleinman, 'Seed Wars: Common Heritage, Private Property, and Political Strategy' *Socialist Review* 95 (1987), 7-41; and Keith Aoki, *Seed Wars: Controversies and Cases on Plant Genetic Resources and Intellectual Property* (Durham, N.C.: Carolina Academic Press, 2008).

[38] Kloppenburg Jr. and Kleinman, note 37 above, 7.

[39] Vandana Shiva, 'GMOs, Seed Wars, and Knowledge Wars', Navdanya, http://www.navdanya.org/news/282-gmos-seed-wars-and-knowledge-wars, last accessed on 22 July 2015.

[40] William Fisher, 'Theories of Intellectual Property' in *New Essays in the Legal and Political Theory of Property* ed. Stephen R. Munzer, 168-200 (Cambridge University Press, 2001), 169. See also: http://cyber.law.harvard.edu/people/tfisher/iptheory.pdf, last accessed on 22 July 2015.

[41] Ibid., 169.

Intellectual property protection is therefore intended to reward and incentivize creators, but the ultimate aim is to develop innovations that will benefit the wider public. There are arguments that failing to provide intellectual property protection as incentives, could lead to under-investment and under-production.[42] A key argument presented in justification of plant patents is that breeders must be rewarded for their work, and thereby incentivized to continue developing new plant varieties that would ultimately benefit larger society.[43]

There have already for a long time been doubts about whether intellectual property protection really leads to innovation, and whether the sought balance is attainable, in theory and in practice. Some prominent authors argue that most innovations do not depend on intellectual property protection.[44] Former Professor of Economics at the University of London, Arnold Plant, wrote an article in 1934 entitled 'The Economic Theory concerning Patents'. He argued that a patent system directs rather than increases inventiveness.[45] Moreover, he concluded that patent protection could lead to overinvestment in research and development in areas with patent potential, subsequently denying or reducing investment in other important but less commercially viable areas of research.[46] These concerns are still valid today, as most investments and innovations are concentrated in commercially viable crops such as maize and wheat, neglecting less commercial, but equally, or perhaps even more, valuable crops.[47] It is not just a question of more innovation, but also of what kind of innovation, and in whose interest.

Jerome Reichman has argued that when 'the regulatory balance tips too far in favor of innovators at the expense of users and competitors, it tends to misallocate the scarce resources devoted to research and development …'.[48] Keith Aoki reiterates this view, and contends that in the rising intellectual property protectionism, '[t]here is no consideration of the idea that traditional intellectual property law has been concerned with striking a balance between society's

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[42] Lionel Bently and Brad Sherman, *Intellectual Property Law*, 3rd ed. (Oxford; New York: Oxford University Press, 2008), 4. Similar justifications were made for tangible property protection. Jeremy Bentham, writing in the 19th century, argued that: 'Without the assistance of the laws, the inventor would almost always be driven out of the market by his rival, who finding himself, without any expense, in the possession of a discovery which has cost the inventor time and expense, would be able to deprive him of all his deserved advantages, by selling at a lower price.' Jeremy Bentham, *The Rationale of Reward* (London, 1830), 318.

[43] Bently and Sherman, note 42 above, 591-601.

[44] See, for example: Peter Drahos and John Braithwaite, *Information Feudalism: Who Owns the Knowledge Economy?* (New Delhi; Oxford: Oxford University Press, 2003), 4.

[45] Arnold Plant, 'The Economic Theory Concerning Patents for Inventions' *Economica* 1 (1934), 39.

[46] Ibid., 39.

[47] Assefa, note 31 above. See also: Rajeev K Varshney et al., 'Can Genomics Boost Productivity of Orphan Crops?' *Nature Biotechnology* 30 (2012), 1172–1176. The authors write, on page 1172, that '[b]reeding for orphan crops is lagging behind major crops although they are key staple crops in many low-income countries where small-holder farmers cannot afford to buy improved seed.'

[48] Jerome H. Reichman, 'From Free Riders to Fair Followers: Global Competition under the TRIPS Agreement' *NYU Journal of International Law and Politics* 29 (1997), 24.

interests and those of individual creators'.[49] Reichman and Aoki acknowledge that intellectual property law must include such a balance between incentivizing innovators and benefiting society at large. However, they contend that this balance is tipped too far in favour of the innovators, notably large private corporations.[50] Aoki has moreover argued that large western seed corporations are guilty of biopiracy, by using genetic resources available in the developing world, modifying these resources, applying for patent rights, and then selling the modified product back to those communities that had initially provided the raw materials.[51]

While intellectual property protection may indeed incentivize investments in certain areas of research, serious doubts exist about whether these investments will benefit society. This question about the balance between rewarding and incentivizing innovations, on the one hand, and benefiting society at large, on the other hand, is relevant also in contradictory narratives of climate-ready seeds.

2 PATENTING CLIMATE-READY SEEDS

The first part of this chapter sketched a broad context within which discussions over corporate patents on climate-ready seeds can be understood. The application of intellectual property rights to (genetically engineered) plants is relatively new, and extremely controversial. This part of the chapter will examine how controversies about plant patents are reflected in contradictory narratives of climate-ready seeds.

2.1 PATENTS NECESSARY TO COMBAT HUNGER IN THE FACE OF CLIMATE CHANGE

One of the narratives of climate-ready seeds, as described in Chapter 1, is that these seeds are necessary in the fight against climate-induced hunger.[52] Seed corporations are the main voices that are producing this narrative. They are also the dominant players in the research and development of, and the application of patent rights on, genetically engineered seeds.[53] This section will show that this narrative of climate-ready seeds contains strong tendencies that

[49] Keith Aoki, 'Neocolonialism, Anticommons Property, and Biopiracy in the (Not-So-Brave) New World Order of International Intellectual Property Protection' *Indiana Journal of Global Legal Studies* 6 (1998), 27.
[50] Ibid., 27, at the bottom of the page: 'entities holding increasingly large blocks of intellectual property rights are not nations, but instead are "private" multinational corporations'.
[51] Ibid., 48.
[52] See Chapter 1, section 3.3.
[53] See Chapter 1, section 3.2.

suggest that (genetically engineered) plants are patentable subject-matter, that patent rights are necessary incentives for the development of climate-ready seeds, and that these seeds will benefit society. Ultimately, the argument that will be made here is that an underlying message in the narrative that promotes climate-ready seeds is that without the incentives of patent rights there would be no end to climate-induced hunger.

The research and development of climate-ready seeds is dominated by private sector corporations. Michael Blakeney writes that '[public expenditure] is declining at a time when private-sector investment in agricultural research is increasing worldwide'.[54] Monsanto is one of the most dominant corporations in the field of plant biotechnology. This company was already spending over 100 million US dollars a year on research and development in the late 1980s.[55] Robert Evenson notes that this was at the time 'a sum greater than all crop research for Sub-Saharan Africa'.[56] The president of the crop protection division of BASF, another large agricultural biotechnology corporation, has more recently stated that his company is spending 188 million US dollars a year specifically on research and development of crops genetically engineered to improve yields and withstand droughts and other abiotic stresses.[57] Monsanto and BASF are also collaborating in developing climate-tolerant crops. Monsanto's chief technology officer in 2010 said that: 'Our yield and stress collaboration with BASF already has brought forth so many promising leads, the first of which we'll see on farm in coming years with our first-generation drought-tolerant corn'.[58] Large agricultural biotechnology corporations are investing in the research and development of climate-ready crops, and are also increasingly filing patent applications.[59] It is evident merely from the number of patent applications, that seed corporations endorse the view that (genetically engineered) plants are patentable subject-matter.

The view endorsed in this narrative of climate-ready is not only that patenting seeds is acceptable, but also that patents are necessary incentives for investing. In a paper on the effect of intellectual property and the biotechnology industry, James Davis and Michele Wales write that

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[54] Michael Blakeney, 'Recent Developments in Intellectual Property and Power in the Private Sector Related to Food and Agriculture' *Food Policy* 36 (2011), 111.

[55] Robert E. Evenson, 'Agricultural Research and Intellectual Property Rights' in *International Public Goods and Transfer of Technology under a Globalized Intellectual Property Regime* ed. Keith E. Maskus and Jerome H. Reichman,188-216, (Cambridge, UK; New York: Cambridge University Press, 2005), 203.

[56] Ibid.

[57] Matt Hopkins, 'BASF, Monsanto Launching Drought-Tolerant Corn in 2014' *Croplife*, 29 May 2013, http://www.croplife.com/crop-inputs/seed-biotech/basf-monsanto-launching-drought-tolerant-corn-in-2014/, last accessed on 22 July 2015. It is now 2015, and I have not been able to find any updated information about the drought-tolerant maize developed through a cooperation between BASF and Monsanto.

[58] Monsanto, 'BASF Plant Science and Monsanto to Expand Their Collaboration in Maximizing Crop Yield' 7 July 2010, http://news.monsanto.com/press-release/basf-plant-science-and-monsanto-expand-their-collaboration-maximizing-crop-yield, last accessed on 22 July 2015.

[59] See Chapter 1, section 3.2 for figures on the patent applications on climate-ready seeds and crops, and the corporations that are involved.

'[t]he ability to raise new capital is directly linked to the proper functioning of intellectual property laws'.[60] Private sectors investments in agricultural biotechnologies have also been linked directly to intellectual property rights. Marta Diaz from the OECD has written that:

> The strengthening of IP [intellectual property] protection in recent decades has been associated with an increase in private sector investment in agriculture-related research and development, and a surge in innovation leading to improved plant varieties, agricultural chemicals and production technologies.[61]

This supports the notion that intellectual property protection serves as an incentive for investing in research and development of climate-ready seeds. In response to criticism by the ETC Group that the concentration of corporate patents on climate-ready seeds does not serve to realize food security, a spokesperson from Monsanto noted that the company must be 'cognizant of our obligation to shareholders who have paid for our research'.[62] This statement reinforces the belief that patent rights incentivize investments and that investments must be rewarded with patent rights. Seed corporations involved in the research and development of climate-ready seeds, and other voices in this narrative that hold that these seeds will contribute to combating hunger in the face of climate change, do not literally say that without the incentives of intellectual property rights they would not invest in these seeds. However, the mere fact that so many patent applications are made, suggests an implicit endorsement of this view.

In the previous section, it was noted that the 'ultimate rationale' of intellectual property protection is maximum benefit to society.[63] Seed corporations link the development of climate-ready seeds to addressing hunger in the face of climate change. Fighting hunger can then be seen as the 'ultimate rationale' of applying patent rights to climate-ready seeds. Looking back at how this narrative of climate-ready seeds was presented in Chapter 1, references such as 'filling tomorrow's rice bowl',[64] 'feeding the world',[65] 'ending food-based misery',[66] and 'without

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[60] James H. Davis and Michele M. Wales, 'The Effect of Intellectual Property on the Biotechnology Industry' *Advances in Genetics* 50 (2003), 427-428.

[61] Marta Diaz, 'IP and Innovation in Agriculture', Innovation Platform, https://www.innovationpolicyplatform.org/content/ip-and-innovation-agriculture, last accessed on 22 July 2015.

[62] Rick Weiss, 'Firms Seek Patents on "Climate Ready" Altered Crops' *The Washington Post*, 13 May 2008, http://www.washingtonpost.com/wp-dyn/content/article/2008/05/12/AR2008051202919.html, last accessed on 22 July 2015.

[63] Fisher, text at note 40 above.

[64] The Economist, 'Genetic Modification Filling Tomorrow's Rice Bowl: Genetic Engineers Are Applying Their Skills to Tropical Crops' *The Economist*, 6 December 2006, http://www.economist.com/node/8380318, last accessed on 22 July 2015. See also: Chapter 1 at note 187.

biotechnology, we'll starve',[67] seem to connect genetically engineered seeds to the ultimate goal of combating hunger. Seed corporations are not plainly saying that patent rights are necessary to combat hunger in the face of climate change. Nevertheless, the discourse coming from this narrative presents a strong, yet subtle, case for patenting climate-ready seeds. New biotechnologies in agriculture are needed to adapt to climate change, investments are necessary to develop new biotechnologies, and incentives in the form of patent rights stimulate these investments. Above all, without these climate-ready seeds, it will be difficult to combat climate-induced hunger. The implicit argument is therefore that patent rights are required to combat climate-induced hunger.

2.2 PATENTS BENEFIT GENE GIANTS BUT DO NOT CONTRIBUTE TO COMBATING HUNGER

Another narrative holds that climate-ready seeds will not contribute to combating climate-induced hunger.[68] NGOs and civil society organizations are the most dominant voices telling this story. A lot of emphasis in this critical narrative focuses on the rising number of patent applications by corporations. This section will show that this narrative of climate-ready seeds fiercely rejects the claim that the applications of patent rights on these seeds incentivize innovations that can combat food insecurity and hunger.

The introduction to this narrative in Chapter 1 indicates that there is a lot of critical emphasis on the rising number of patent applications.[69] In a 2010 report on climate-ready seeds, the ETC Group states that:

> **There is no societal benefit when governments allow six corporations to monopolize food.** The pretext of indispensible [sic] so-called climate-ready genes will increase farmer dependence on GM crops, jeopardize biodiversity, and threaten global

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[65] Bayer, 'Annual Report 2009', http://www.bayer.com/en/gb-2009-en.pdfx, 114, last accessed on 22 July 2015. See also: Chapter 1 at note 178.
[66] Stephen S. Jones, 'Progress without Patents: Public Maintenance of Agricultural Knowledge' *Journal of Environmental Law and Litigation* 19 (2004), 470. See also: Chapter 1 at note 196.
[67] A commentary article by the director of the biotechnology research and education program at UC Davis, published in 1999, is titled 'without biotechnology, we'll starve'. Martina McGloughlin, 'Without Biotechnology, We'll Starve' *Los Angeles Times*, 1 November 1999, http://articles.latimes.com/1999/nov/01/local/me-28638, last accessed on 22 July 2015.
[68] See Chapter 1, section 3.3.
[69] Ibid.

food sovereignty. Governments must suspend the granting of all patents on climate change-related genes and traits.[70]

The ETC Group highlights a number of issues related to patent applications on climate-ready seeds, including concerns over farmers' access to crops, biodiversity loss, and food sovereignty.[71] The civil society group moreover calls for a suspension of the granting of patents on climate-ready seeds. The main point (bold in the text above) seems to be that a handful of private corporations are monopolizing 'food' by applying for so many patents, including on climate-ready seeds.

The ETC Group refers to large agricultural biotechnology corporations as 'Gene Giants'.[72] Critics accuse these corporations of being 'climate change profiteers',[73] interested in their own benefits from seeds patents but not in feeding the world. The International Institute for Environment and Development (IIED) has referred to the 'corporate control of the seeds they [farmers] plant' as the biggest obstacle to effectively addressing hunger in the face of climate change.[74] The way in which critiques of climate-ready seeds are presented suggests that the focal point of dissatisfaction is private corporations benefiting from exclusive intellectual property rights, while these corporations are not contributing to combating hunger under the conditions of climate change. In terms of the more general controversies over patent rights as described in part 1 of this chapter, this narrative concentrates its criticism on their view that there is no societal benefit from these seed patents. Questions of whether plants should be patentable subject-matter and whether patents incentivize innovations, are not as explicit.

Former Assistant Director of the FAO, Louise Fresco, has stated that most of the genetically engineered crops are developed with an eye to reducing input and labour costs in large scale production systems, and 'not to feed the developing world or improve food quality'.[75]

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[70] ETC Group,'Capturing "Climate Genes": Gene Giants Stockpile Patents on "Climate-Ready" Crops in Bid to Become "Biomassters"' (ETC Group, 2010), 2. The emphasis in bold was present in the original text.

[71] These are also some of the main concerns that are part of the food sovereignty movement, defined in Chapter 1 as a resistance movements against the neoliberal food regime. See Chapter 1, section 2.3.

[72] ETC Group 2010, note 70 above. The subtitle of this report is: 'Gene Giants Stockpile "Climate-Ready" Patents in a Bid to Become "Biomassters"'.

[73] Geofrey Lean, 'Biotech Giants Demand a High Price for Saving the Planet' *The Independent*, 8 June 2008, http://www.independent.co.uk/environment/climate-change/biotech-giants-demand-a-high-price-for-saving-the-planet-842480.html, last accessed on 22 July 2015; ETC Group, 'News Release: Gene Giants Grab "Climate Genes": Amid Global Food Crisis, Biotech Companies Are Exposed as Climate Change Profiteers', 13 May 2008, http://www.etcgroup.org/fr/node/688, last accessed on 22 July 2015.

[74] International Institute for Environment and Development, 'Seed Industry Ignores Farmers' Rights to Adapt to Climate Change' IIED, 7 September 2009, http://www.iied.org/seed-industry-ignores-farmers-rights-adapt-climate-change, last accessed on 22 July 2015. See also: Chapter 1 at note 213.

[75] Louise O. Fresco, 2003. 'Which Road Do We Take? Harnessing Genetic Resources and Making Use of life Sciences, a New Contract for Sustainable Agriculture', EU Discussion Forum "Towards Sustainable Agriculture for

This critique is in line with Arnold Plant's observation that patent rights direct inventiveness, rather than necessarily increasing it.[76] In this case, seed patents that are applied for mostly by private corporations steer inventiveness towards the greatest profit for corporations. They do not necessarily lead to greater inventiveness, at least not of the type that will eradicate global hunger. The ETC Group in a report about the climate and food crises wrote that:

> In the face of climate chaos, the industrial chain is imposing a patent regime that prizes uniformity over diversity and enforces a technological model that costs more – and takes more time – to breed one genetically-engineered variety than it does to breed hundreds of conventional varieties. The industrial food chain doesn't know who the hungry are, where they are, or what they need.[77]

The critical emphasis that tends to prevail in this narrative is on the corporate domination of climate-ready seeds through patent rights. Philippe Cullet and Radhika Koluru have argued that intellectual property protection in agriculture is 'intrinsically linked to food security', and that the enhancement of food security is the 'ultimate rationale' for the legal protection of plant varieties.[78] This view is in line with more general theories of intellectual property protection.[79] The argument that comes to the fore in criticisms of climate-ready seeds is that a corporate patent monopoly will not contribute to realizing this ultimate rationale. The key issue is that this patent regime will not feed the hungry in the face of climate change.

In addition to criticizing the growing corporate patent rights on climate-ready seeds, critics also rely on alternative forms of proprietary rights in efforts to achieve food sovereignty for farmers and developing countries. These alternative rights will be discussed in the final part of this chapter.

Developing Countries: Options from Life Sciences and Biotechnologies" (Brussels, 30-31 January 2003), www.fao.org/ag/magazine/fao-gr.pdf, last accessed on 22 July 2015.

[76] Plant, notes 45 and 46 above. See also: Jack Ralph Kloppenburg, *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000*, 2nd ed., Science and Technology in Society (Madison, Wis.: University of Wisconsin Press, 2004), 8. The increased subordination of agricultural plant sciences to private capital 'has shaped both the content of research and, necessarily, the character of its products'.

[77] ETC Group, 'Who Will Feed Us? Questions for the Food and Climate Crises', November 2009, http://www.etcgroup.org/sites/www.etcgroup.org/files/ETC_Who_Will_Feed_Us.pdf, last accessed on 22 July 2015.

[78] Philippe Cullet and Radhika Koluru, 'Plant Variety Protection and Farmers' Rights: Towards a Broader Understanding' *Dehli Law Review* 24 (2003), 1-2.

[79] Fisher, notes 40 and 41 above.

3 SOVEREIGN RIGHTS OVER NATURAL RESOURCES AND FARMERS' RIGHTS

A small number of large seed corporations are increasingly filing patent applications on climate-ready seeds, and this corporate domination is a focal point of contention in contradictory narratives of climate-ready seeds. For these seed corporations to develop climate-resilient crops, they need to have access to raw materials – existing seeds and crops and their genetic resources – to work with. Most of the plant genetic resources in the world are located in the developing countries, and there is serious dissatisfaction on the part of developing countries about the lack of reward for allowing seed corporations to have free access to these materials.[80] These are some of the main disagreements between developed and developing countries in negotiating the TRIPS Agreement.

Developing country governments – with strong support from NGOs and civil society organizations – have sought to devise ways in which they can gain benefits from the genetic resources in their territories. They have done this notably through the articulation of 'sovereign rights over natural resources' and 'farmers' rights'. The first section will explain the emergence of these concepts, and how they are presented as oppositions to plant patents. The second section will then analyse how these concepts are relevant and invoked in the narrative that holds that corporately patented climate-ready seeds will not contribute to combating climate-induced hunger.

3.1 PLANT TREATY, BIOLOGICAL DIVERSITY, AND FARMERS' RIGHTS

This section will set out the resistance against increasing corporatization and privatization of agriculture through the Treaty on Plant Genetic Resources for Food and Agriculture and the Convention on Biological Diversity. The rise of the idea of sovereign rights over natural resources will be tracked through these two treaties. Then, the concept of farmers' rights will be considered.

3.1.1 The Undertaking and Treaty on Plant Genetic Resources for Food and Agriculture

As a response to the rising applications for intellectual property rights on plants applied for by breeders and corporations in the US and Europe, third world countries adopted the International

[80] This dissatisfaction was evident during the negotiating phase of the TRIPS Agreement. Linarelli, notes 21 and 22 above.

Undertaking on Plant Genetic Resources for Food and Agriculture (the Undertaking) at a session of the Food and Agriculture Organization (FAO) in 1983.[81] Through this Undertaking, these countries designated plant genetic resources as 'common heritage of mankind' that should be 'available without restriction'.[82] The common heritage of mankind principle is, strictly legally speaking, only applicable to the 1979 Moon Treaty and the 1982 UN Convention on the Law of the Seas.[83] As Malcolm Evans describes it, the concept was intended to encompass 'the desire to prevent the more powerful states from taking advantage of their greater technological capacities to appropriate for themselves resources outside of areas of national jurisdiction'.[84] More recently, the concept has been used in the context of natural resources management. Developing countries have invoked the concept of common heritage in efforts to prevent exploitation of their genetic resources by developed countries and corporations, through the Undertaking and later the Plant Treaty.

The Undertaking was a voluntary agreement and therefore not legally binding. It eventually materialized in the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR or Plant Treaty), which entered into force in 2004.[85] The ITPGR's main objective is 'to facilitate the exchange of seeds and other germplasm to be used for research, breeding and crop development'.[86] The Plant Treaty is, according to its drafters and proponents, 'crucial in the fight against hunger'.[87] Its central focus is conservation, sharing, and access to plant genetic resources. Unlike the earlier Undertaking, the text of the ITPGR does not mention the term common heritage. Instead, the preamble states that 'plant genetic resources for food and agriculture are a *common concern* of all countries'.[88] Common concern suggests that all countries should care about and take responsibility for the conservation and distribution of plant genetic resources for food and agriculture. Moreover, it recognizes the 'sovereign rights' of states over plant genetic resources in their territory.[89] Whereas the principle of common heritage appears to inherently reject exclusive proprietary rights, the idea of common concern does not connote a particular sense of ownership.

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[81] Food and Agriculture Organization, 'International Undertaking on Plant Genetic Resources, annex II, Farmers' Rights' Resolution 5/89, November 1989, Rome.
[82] Stenson and Gray, note 5 above, 17.
[83] Patricia Birnie et al, *International Law and the Environment* (New York, US: Oxford University Press 2009), 197.
[84] Malcolm Evans, 'Common Heritage of Mankind' in *The New Oxford Companion to Law*, ed. Peter Cane, Joanne Conaghan, and David M. Walker (Oxford, UK; New York: Oxford University Press, 2008).
[85] International Treaty on Plant Genetic Resources for Food and Agriculture, Food and Agriculture Organization. Entry into force 29 June 2004, http://www.planttreaty.org/, last accessed on 22 July 2015.
[86] Helfer and FAO, note 10 above, 87.
[87] Plant Treaty, note 85 above,
[88] Ibid., Preamble, V. Emphasis added.
[89] In the preamble and article 10.

Perhaps more interesting is the emphasis on the sovereign rights of states. This appears to be a distancing from the rejection of proprietary rights in the common heritage idea. The concept of 'sovereign rights over natural resources' evolved in the 1950s. Genetically-rich developing countries used this concept in attempts to secure their benefits from the exploitation of natural resources in their territories.[90] Instead of following the common heritage argument that there should be no proprietary rights over these resources, the 'sovereign rights' principle asserts that those countries in whose territories genetic resources are available should also be granted some form of ownership rights.[91]

One of the pitfalls of the common heritage principle is that unobstructed access to plant genetic resources has in many ways benefited seed corporations.[92] Access to the genetic richness located mostly in territories of developing countries has provided the raw materials for the very seeds and crops over which corporations are claiming patent rights. The shift to sovereign rights can be seen as an attempt to have genetically rich developing countries at least share the benefits of the exploitation of plant genetic resources. The text and objectives of the ITPGR closely correspond to those of the Convention on Biological Diversity.

3.1.2 The Convention on Biological Diversity

The Convention on Biological Diversity was drafted in the light of the recognition that the diversity of biological resources is vital to the economic and social development of humanity.[93] It entered into force in 1993, one year prior to the TRIPS Agreement. The objectives of the CBD are:

> [T]he conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies.[94]

The preamble to the CBD affirms that 'the conservation of biological diversity is a common concern of mankind', and reaffirms that 'states have sovereign rights over their own biological

[90] Nico Schrijver, *Sovereignty over Natural Resources Balancing Rights and Duties* (Cambridge: Cambridge University Press, 1997), 3.
[91] Birnie et al, note 83 above, 191: 'The right of peoples and nations of permanent sovereignty over their natural wealth and resources' is understood to include 'possession, use and disposal, over all its natural resources'.
[92] Linarelli, notes 21 and 22 above.
[93] Convention on Biological Diversity, 'History of the Convention', http://www.cbd.int/history/, last accessed on 22 July 2015.
[94] 1993 Convention on Biological Diversity, A.T.S. 32 / 1760 U.N.T.S. 79 / 31 I.L.M. 818 (1992), Article 2.

resources'. Acknowledging and affirming the sovereign *rights* of states seems to suggest an acceptation of some form of proprietary rights. In fact, article two of the CBD (as cited partly here above), which states its objectives, ends with the words 'taking into account all rights over those resources and to technologies'. The CBD thus endorses intellectual property rights over biological resources, but underscores the importance of ensuring access to its benefits, explicitly with regard to transferring technologies. Many consider the conservation of biodiversity to be of critical importance in meeting the world's food needs.[95] The website of the CBD states the following about the link between climate change and biodiversity:

> Conserving natural terrestrial, freshwater and marine ecosystems and restoring degraded ecosystems *(including their genetic and species diversity)* is essential for the overall goals of both the *Convention on Biological Diversity* and the *United Nations Framework Convention on Climate Change* because ecosystems play a key role in the global carbon cycle and in *adapting to climate change*, while also providing a wide range of ecosystem services that are essential for human well-being and the achievement of the Millennium Development Goals.[96]

Climate change is predicted to adversely affect the availability and conservation of biodiversity.[97] Moreover, some argue that the privatization of agricultural research and the increase in corporate patenting of seeds and crops will lead to further biodiversity loss.[98] The CBD is arguably the single most important international legal text calling for a distribution of benefits from plant genetic resources in line with objectives such as the insurance of food security and addressing hunger. The text of the CBD contains numerous references to '(bio)technologies',[99] and a few references to cooperation with the 'private sector',[100] signalling a conformity with climate change adaptation law in accepting the value of both technology and the engagement of the private sector. Article 16(5) of the CBD recognizes 'that patents and other intellectual property rights

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[95] The FAO, for instance, writes that '[a]chieving food security for all is intrinsically linked to the maintenance of biodiversity'. The Food and Agriculture Organization, 'Biodiversity', http://www.fao.org/biodiversity/en/, last accessed on 22 July 2015.

[96] CBD, 'Climate Change and Biodiversity: Introduction', http://www.cbd.int/climate/intro.shtml, last accessed on 22 July 2015. Emphases added.

[97] CBD, 'Climate Change and Biodiversity', https://www.cbd.int/climate/, last accessed on 22 July 2015.

[98] See, for example, the policy goals of the ETC Group, at note 70 above, that mention also biodiversity loss.

[99] For instance, the preamble to the CBD acknowledges that '[a]ppropriate access to relevant technologies can be expected to make a substantial difference in the world's ability to address the loss of biological diversity'. Moreover, the use of terms in article 2 stipulates that '"Technology" includes biotechnology'. Most of the references to technology in the CBD relate to 'access and transfer of technology'.

[100] Article 10(e) encourages cooperation between governments and the private sector in ensuring the sustainable use of biological resources. Article 16(4) requires governments to ensure that the private sector cooperates in facilitating access to, and transfer of, technologies.

may have an influence on the implementation of [the CBD]', and that the Contracting Parties 'shall cooperate in this regard subject to national legislation and international law in order to ensure that such rights are supportive of and do not run counter to its objectives.' This reflects a realistic acknowledgement that patents and other intellectual property rights on plants exist, and a call for a concerted effort to make these property rights in line with the objectives of the CBD.

The notion of common heritage left plant genetic resources open to appropriation. As Jack Kloppenburg described it, '[w]hat "flows out … as the 'common heritage of mankind' … returns as a commodity"'.[101] The ITPGR and the CBD no longer adopt the term common heritage, but instead consider plant genetic resources as 'common concern' and advocate sovereign rights over natural resources. The next section will explore the idea of farmers' rights, which is another alternative form of a proprietary right often invoked in opposition to corporate seed patents.

3.1.3 Farmers' Rights

The concept of 'farmers' rights' emerged as a 'strategy of resistance against the perceived inequities of intellectual property rights regimes for plant varieties'.[102] Stephen Marglin has noted that:

> With the approval of the new version of GATT, an important step has been taken to protect the scientific contributions of seedsmen – while doing nothing to protect the contributions of nameless and countless cultivators whose patient labours have improved indigenous varieties over centuries and even millennia.[103]

Farmers' rights are intended to recognize the contributions made by farmers and indigenous communities in agriculture, and to regain control over 'their' plant genetic resources.[104] The introduction of the term farmers' rights was expressly related to concerns about biodiversity, voiced in the setting of FAO meetings during the 1970s and 1980s.[105] Two NGOs, the Rural

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[101] Laurelyn Whitt, *Science, Colonialism, and Indigenous Peoples: The Cultural Politics of Law and Knowledge* (Cambridge: Cambridge University Press, 2009), 162, note 20, citing Jack Kloppenburg and Daniel Kleinman, 'Seed Wars: Common Heritage, Private Property, and Political Strategy' *Socialist Review* 95 (September/October 1987), 25.
[102] Craig Borowiak, 'Farmers' Rights: Intellectual Property Regimes and the Struggle over Seeds' *Politics & Society* 32 (2004), 511.
[103] Stephen A. Marglin, 'Farmers, Seedsmen, and Scientists: Systems of Agriculture and Systems of Knowledge' in *Decolonizing Knowledge: From Development to Dialogue*, ed. Frédérique Apffel-Marglin and Stephen A. Marglin, 185-243 (New York: Oxford University Press, 1996), 204.
[104] Helfer and FAO, note 10 above, 17.
[105] 'The History of Farmers' Rights in the FAO', Farmers' Rights: Resource Pages for Decision-Makers and Practitioners, http://www.farmersrights.org/about/fr_history.html, last accessed on 22 July 2015.

Advancement Foundation International (RAFI) – the predecessor of the ETC Group – and Genetic Resources Action International (GRAIN) were instrumental in addressing concerns about the exploitation of the Third World's genetic resources by western breeders and corporations.[106]

Article 9 of the 1983 Plant Treaty explicitly recognizes farmers' rights, stating:

> The Contracting Parties recognise the enormous contribution that the local and indigenous communities and farmers of all regions of the world, particularly those in the centres of origin and crop diversity, have made and will continue to make for the conservation and development of plant genetic resources which constitute the basis of food and agriculture production throughout the world. [107]

Article 9.2 of the same treaty articulates that national states are responsible for protecting farmers' rights. This objective is similar to that of sovereign rights, with the exception that farmers' rights grant rights to individuals and not states. The definition of farmers' rights is not very clear-cut, but it encompasses a number of goals. Philippe Cullet and Radhika Koluru, for instance, have outlined the multiple goals of farmers' rights, including granting 'full property rights' to farmers, contributing to agricultural biodiversity, and contributing to realizing food security.[108]

While Cullet and Koluru refer to one function of farmers' rights as granting 'full property rights' to farmers, others argue that farmers' rights are not really 'rights' at all. Olivier De Schutter has referred to farmers' rights as 'rights without remedies' and 'rights only by name'.[109] The relationship between farmers' rights and other intellectual property rights remains ambiguous. At the outset, RAFI envisaged farmers' rights as 'a new type of collective intellectual property rights' intended to counter plant variety rights.[110] Whichever way farmers' rights are formally classified, those invoking this right do so as a means through which to seek recognition of the valuable contributions made by farmers and break the corporate monopoly.

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[106] Genetic Resources Action International (GRAIN), 'Towards a Biodiversity Community Rights Regime', Seedling 12, 2-14, 1995, https://www.grain.org/article/entries/28-towards-a-biodiversity-community-rights-regime, especially the section: 'Proposal for an Expanded Farmers' Rights Framework', last accessed on 22 July 2015.
[107] Plant Treaty, note 85 above, Article 9.
[108] Cullet and Koluru, note 78 above, 8.
[109] Olivier De Schutter, 'The Right to Food: Seed Policies and the Right to Food: Enhancing Agrobiodiversity and Encouraging Innovation' (United Nations General Assembly, 2009), 16, para 43. De Schutter emphasizes the vague provisions of farmers' rights, the lack of enforcement at international level, and the lack of a forum to discuss these so-called 'rights'.
[110] Keith Aoki, 'Free Seeds, Not Free Beer: Participatory Plant Breeding, Open Source Seeds, and Acknowledging User Innovation in Agriculture' *Fordham Law Review* 77 (2009), 2281.

3.2 SOVEREIGN RIGHTS AND FARMERS' RIGHTS IN NARRATIVES OF CLIMATE-READY SEEDS

The concepts of sovereign rights over natural resources and farmers' rights are relevant in critical discourse on climate-ready seeds. Critics do not always invoke these concepts expressly, but they do articulate the objectives – including preservation of biodiversity, access and benefit sharing, protection of traditional knowledge, and recognition of farmers' contributions – that underlie these concepts.

Civil society organizations critical of climate-ready seeds often stress the importance of biodiversity conservation in adapting to the adverse impacts of climate change on agriculture and view corporate domination of seeds as a risk to biodiversity. The ETC Group in a 2010 report has stated that '[t]he pretext of indispensible [sic] so called climate-ready genes will increase farmer dependence on GM crops, *jeopardize biodiversity*, and threaten global food sovereignty.'[111] In another reference on their website, the ETC Group notes that: 'Biological diversity is the cornerstone of sustainable agriculture and world food security' and that: 'The UN Convention on Biological Diversity … is a legally-binding framework for conservation and sustainable use of biodiversity.'[112] Farmers' organization Navdanya also affirms the importance of biodiversity, especially 'to tackle the hazards of climate change and food security'.[113] The organization has moreover stated that: '[w]orking with citizens' movements, grassroots organizations, NGOs and governments, we have made significant contributions to the Convention on Biological Diversity …'.[114] There is recognition that biodiversity conservation is necessary to deal with the impacts of climate change on food production and there is an acknowledgement of the CBD as an international and legally binding document to realize this goal.

There are, however, also criticisms of the CBD. La Via Campesina, for instance, has actively campaigned against what they consider the appropriation of the CBD by seed corporations and western governments, undermining the rights of farmers. During a Conference of the Parties to the CBD, La Via Campesina has called on States Parties to 'ban the introduction and cultivation of GMO seeds'.[115] Although this civil society organization promotes the value of

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[111] ETC Group 2010, note 70 above, 2. Emphasis added.
[112] ETC Group, 'Biodiversity and Cultural Diversity', www.etcgroup.org/issues/biodiversity-cultural-diversity, last accessed on 22 July 2015.
[113] Navdanya, 'The Law of the Seed', 6 May 2013, www.navdanya.org/attachments/lawofseed.pdf, 8, last accessed on 22 July 2015.
[114] Navdanya, 'GMO Free Campaign', navdanya.org/campaigns/gmo-free, last accessed on 22 July 2015.
[115] La Via Campesina, 'Convention on Biological Diversity: Farmers Demand an End to the Commercialization of Biodiversity, GM Seeds and Synthetic Biology', 11 October 2012, http://viacampesina.org/en/index.php/main-issues-mainmenu-27/biodiversity-and-genetic-resources-mainmenu-37/1308-convention-on-biological-diversity-

biodiversity, at the same time it does not believe that the CBD as it stands can achieve biodiversity conservation, as the Convention accepts the use of genetically engineered seeds.[116] Navdanya has drafted a so-called 'Law of the Seed',[117] in an attempt to promote biodiversity conservation and farmers' rights.[118] This 'Law' also calls for a review of article 27.3(b) of the TRIPS Agreement, and urges governments to 'protect biodiversity and reverse patents on life and patents on seed'.[119] The ETC Group has likewise called for the rejection of patent rights on seeds.[120]

Voices that feed into the critical narrative of climate-ready seeds acknowledge the importance of biodiversity, but are critical of the way in which the Convention on Biological Diversity endorses patent rights on seeds. However, the CBD is the only international legally binding treaty on biodiversity. The problem for NGOs, civil society organizations, activists, scholars, etc., is that there are no other international legal avenues through which to voice their concerns and be part of the discussion on hunger, climate change, and intellectual property rights. They are bound to rely on the CBD if they wish to take part in the discussions. At the same time, arguing in line with the objectives of the CBD implies recognizing some form of proprietary rights on natural resources.

The CBD does not reject proprietary rights on plants – as the Undertaking did – but rather stipulates that states should have sovereign rights over natural resources. The text of the United Nations Framework Convention on Climate Change (UNFCCC) also affirms the notion of sovereign rights over natural resources.[121] Civil society organizations can be seen to present arguments in line with this concept of sovereign rights. For instance, Navdanya in 'The Law of the Seed' refers to 'seed sovereignty' explains as the 'recognition in law' of the 'sovereign rights of farmers'.[122] The concept of sovereign rights over natural resources can also be seen in

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farmers-demand-an-end-to-the-commercialization-of-biodiveristy-gm-seeds-and-synthetic-biology, last accessed on 22 July 2015.

[116] See the reference to Article 16(5) of the CBD in section 3.2.1 above.

[117] Navdanya 2013, note 113 above.

[118] 'The Law of the Seed aims to bring back biodiversity and recognition of farmer's rights …'. Ibid., 7. Navdanya also writes in this 'Law' that: 'science and laws are being manipulated, threatening the seed and food sovereignty of peoples in all parts of the world.' Ibid., 39.

[119] Ibid., 39.

[120] See, for instance: ETC Group 2010, note 70 above.

[121] Schrijver, note 90 above, 261. UNFCCC preamble: 'Recalling also that States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies …'.

[122] Navdanya 2013, note 113 above. Article 14 on page 35 of the document.

accordance with food sovereignty movements.[123] The aim is to allow developing country governments and farmers the right to 'exploit their own resources'.[124]

The same NGOs – notably GRAIN and the predecessor of the ETC Group – that are some of the main actors in criticizing corporate patents on climate-ready seeds, have also played a key role in articulating the concept of farmers' rights.[125] The idea of farmers' rights is often used to counter corporate patents on seeds. The ETC Group argues that corporate patent rights on climate-ready seeds 'undermine the rights of farmers to save and exchange seeds' in one of their reports on patenting the 'climate genes'.[126] The International Institute for Environment and Development supplies the argument that farmers should have the same rights over their traditional seed varieties as commercial breeders and corporations have over their modified varieties.[127] The IIED further argues that farmers need 'incentives to continue sustaining' agricultural biodiversity.[128] This bears close resemblance to the dominant theory that justifies the application of patent rights on plant genetic resources.[129]

In a report on seed policies and the right to food,[130] the previous Special Rapporteur on the Right to Food linked climate change to food insecurity and seed policies, as well as recognizing the importance of traditional knowledge in agriculture.[131] The report argues that we must 'restore an adequate balance' between corporate or commercial property rights and farmers' rights. 'Strengthening the protection of farmers' rights' is explicitly mentioned as a way to achieve this balance.[132] GRAIN published an article on farmers' rights, concluding that:

> [T]he collective rights of farmers and indigenous peoples to their seeds must be included or be imposed on the agenda of [international meetings focusing on the food crisis, the

[123] See Chapter 1, section 2.3 for more information about food sovereignty movements.
[124] Schrijver and UNFCCC, note 121 above.
[125] See, for example: ETC Group, 'Human Rights / Farmers' Rights', http://www.etcgroup.org/content/human-rights-farmers-rights, last accessed on 22 July 2015; and GRAIN, 'Mobilisation to Defend Farmers' Rights', 17 January 2014, http://www.grain.org/bulletin_board/entries/4856-mobilisation-to-defend-farmers-rights, last accessed on 22 July 2015.
[126] ETC Group, 'Patenting the "Climate Genes" … and Capturing the Climate Agenda' (ETC Group, 2008), 1.
[127] IIED, note 74 above, quoting Ruchi Pant of Ecoserve in India: 'They [farming communities] need the same rights over their traditional seed varieties and associated knowledge as corporations have over modern varieties they develop and patent.'
[128] Ibid.
[129] See: Fisher, note 41 above. See also: Cullet and Koluru, note 78 above.
[130] De Schutter, note 109 above.
[131] Ibid., 16 at para. 43.
[132] Ibid.

> climate crisis, and food sovereignty], as an essential contribution to solving the food and climate crises and achieving food sovereignty.[133]

Critics do still expressly reject the application of private intellectual property rights on seeds altogether. In one of their reports, Navdanya wrote that 'climate resistant crops should not be patented' and that patenting them constitutes 'robbing farmers of traditional knowledge'.[134] However, Navdanya also promotes biodiversity conservation and farmers' rights, especially in the context of climate change.[135] The central theme in the critical narrative of climate-ready seeds seems to be: if finding a good balance in the patent system between rewarding seed corporations and benefiting larger society does not work, then the only other option is to have developing country governments and farmers claim their own forms of intellectual property rights over seeds and plant genetic resources.

In this light, Craig Borowiak has written:

> Given the way that, in the latter half century, 'rights' have effectively become the only normative game in town, with property rights in the preeminent position, the successful mobilization of breeders' rights by large pharmaceutical and agriculture interests has left opponents with few avenues of resistance aside from positing rights claims of their own.[136]

Considering narratives of climate-ready seeds, the implication is that there simply is no way to engage in discussions on these seeds other than in terms of some form of intellectual property rights, be it patent rights, sovereign rights or farmers' rights.

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[133] Guy Kastler, 'ITPGR: Farmers' Rights or a Fools Bargain?' *Seedling* (October 2009), http://www.grain.org/article/entries/786-itpgr-farmers-rights-or-a-fools-bargain, last accessed on 22 July 2015.
[134] Ashok B. Sharma, 'Climate Resistant Crops Should Not Be Patented' *The Financial Express*, 13 June 2009, http://www.financialexpress.com/news/climate-resistant-crops-should-not-be-patented/476013/2, last accessed on 22 July 2015.
[135] See, for example: Navdanya, 'Climate Change & Biodiversity', http://www.navdanya.org/climate-change/climate-change-and-biodiversity, which recognizes the importance of protecting biodiversity and defending 'farmers' collective rights in the context of climate change', last accessed on 22 July 2015.
[136] Borowiak, note 102 above, 522.

CONCLUSION

This chapter has shown the relevance of intellectual property law in discussions about climate-ready seeds. The main arguments in discourses about climate-ready seeds centre on the rapidly increasing patent applications by seed corporations on genetically engineered climate-resilient seeds. These contentions take place in the context of larger debates on the application of intellectual property rights to plants and other living things. The chapter started by explaining how plants came to be viewed as patentable subject-matter. This development began in the US and Europe, and was reinforced in international law through the TRIPS Agreement. Article 27.3(b) of TRIPS stipulates that states must provide for patent protection or a *sui generis* form of protection for plant varieties. Notwithstanding this recognition of plants as patentable subject-matter, patenting plants remains very controversial. The first part of the chapter also explained some of the key issues related to patenting (genetically engineered) seeds.

The second part of the chapter discussed patent rights on climate-ready seeds, examining this issue from the perspective of different narratives. The main observation that came out of this analysis was that those who promote climate-ready seeds tend to argue along the lines that patents are necessary incentives for the development of climate-ready seeds, and that these seeds are necessary to address climate-induced hunger. Conversely, opponents tend to focus their criticism on the corporate monopoly of climate-ready seed patents, and argue that this monopoly benefits see corporations but does not contribute to addressing climate-induced hunger.

The third and final part of this chapter looked at the concepts of 'sovereign rights over natural resources' and 'farmers' rights'. Critics invoke these 'rights', often implicitly, in attempts to shift the balance away from an excessive provision of patent rights to corporations towards more recognition and more sovereignty for developing countries and farmers. The primary contention that surfaces in these debates is who should be entitled to proprietary rights over seeds, and how these rights should be distributed.

The next chapter will explore another area of international law that is frequently employed by those who oppose privatization and corporatization of solutions to hunger and climate change, namely human rights.

4. HUMAN RIGHTS AND CLIMATE-READY SEEDS

INTRODUCTION

This chapter will examine the role that international human rights law plays in narratives of climate-ready seeds. The first part of this chapter will outline the links between climate change and human rights. Climate change has recently come to be seen as a threat to human rights. Concurrently, human rights, and particularly the right to food, are presented as part of the solution to climate-induced hunger. The focus here will be on 'rights-based approaches', or using human rights standards as tools to direct adaptation strategies. The second part of the chapter will examine how the right to food is pertinent to different narratives of climate-ready seeds. The third and final part of the chapter will discuss the relationship between human rights and intellectual property rights, focusing on the right to food and seed patents.

The previous chapter argued that the principal controversy surrounding climate-ready seeds is the growing number of corporate patent applications. How is human rights law, and particularly the right to food, used to deal with this strife? The main argument in this chapter is that human rights are relevant for, and invoked in, all narratives of climate-ready seeds, and aimed primarily at directing this proposed adaptation strategy towards contributing to the realization of the right to food.

1 HUMAN RIGHTS-BASED APPROACHES AND CLIMATE CHANGE

International human rights law has been regularly incorporated in discussions on climate change. The first part of this chapter will explain the link between human rights and climate change, and why human rights law is relevant for narratives of climate-ready seeds. The second part will explain human rights-based approaches.

1.1 HOW HUMAN RIGHTS ENTERED THE DISCUSSION ON CLIMATE CHANGE

Human rights law interacts with climate change in a number of ways. In recent years, the impacts of climate change have come to be seen not only as threats to the environment, agriculture, the

economy, and many aspects of human life, but also as threats to, and potential violations of, human *rights*.[1] Recent interest in the human rights dimensions of climate change was instigated by a case brought by the Inuit against the United States for a violation of the right to life, among other human rights,[2] and by the plight of small island developing states who are facing the perilous prospect of inundation as a result of climate change.[3] Representatives of small island developing states adopted the Male' Declaration on the Human Dimensions of Global Climate Change in 2007, explicitly asking for the recognition of human rights implications of climate change.[4]

The UN Human Rights Council passed resolution 7/23 in 2008.[5] This resolution spells out the concern that 'climate change poses an immediate and far-reaching threat to people and communities around the world and has implications for the full enjoyment of human rights'.[6] The impacts of climate change, as noted previously, are widespread across sectors. Different climate change impacts can therefore have implications for a wide array of human rights. Simon Caney has argued that 'climate change jeopardizes some key human rights', including the right to life, the right to health, and the right to subsistence.[7] In addition to climate change impacts

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[1] See, for example: Siobhán Alice McInerney-Lankford, 'Climate Change and Human Rights: An Introduction to Legal Issues' *Harvard Environmental Law Review* 33 (2009); Stephen Humphreys (ed), *Human Rights and Climate Change* (Cambridge; New York: Cambridge University Press, 2009); Olivier De Schutter, 'Climate Change is a Human Rights Issue – and That's How We Can Solve It' *The Guardian*, 24 April 2012, http://www.theguardian.com/environment/2012/apr/24/climate-change-human-rights-issue, last accessed on 22 July 2015; Mary Robinson, 'Climate Change is an Issue of Human Rights' *The Independent*, 10 December 2008, http://www.independent.co.uk/voices/commentators/mary-robinson-climate-change-is-an-issue-of-human-rights-1059360.html, last accessed on 22 July 2015; UN Officer of the High Commissioner for Human Rights, 'Climate Change is a Human Rights Issue', 27 March 2015, http://www.ohchr.org/EN/NewsEvents/Pages/ClimateChangeHumanRightsIssue.aspx, last accessed on 22 July 2015; Oxfam International, 'Climate Wrongs and Human Rights: Putting People at the Heart of Climate-Change Policy', Oxfam Briefing Paper 117, September 2008, https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/bp117-climate-wrongs-and-human-rights-0809_9.pdf, last accessed on 22 July 2015.

[2] The land on which Inuit live in the Arctic region has been dramatically affected by climate change experienced over the past few decades. To address their concerns over the effects of climate change on their lives, Inuit communities pursued a complaint against the United States in 2005 before the Inter-American Human Rights Commission, claiming violations of their human rights, including the rights to life and the right to use and enjoy their personal property. Although the petition was rejected, the court did hear testimonies on the links between climate change and human rights threats. Human rights hereby became part of the discussions on climate change. See: Ana Núñez, 'The Inuit Case' The Center for International Environmental Law, www.ciel.org/Publications/Climate/CaseStudy_Inuit_Sep07.pdf, last accessed on 22 July 2015. See also: Derek Bell, 'Climate Change and Human Rights', 4 *WIREs Climate Change* 2013, 160.

[3] Siobhán Alice McInerney-Lankford et al., 'Human Rights and Climate Change: A Review of the International Legal Dimensions' (Washington, D.C.: World Bank, 2011), 8.

[4] Representatives of Small Island Developing States, 'Male' Declaration on the Human Dimension of Global Climate Change' (Male', Republic of Maldives, Adopted 14 November 2007), http://www.ciel.org/Publications/Male_Declaration_Nov07.pdf, last accessed on 22 July 2015.

[5] United Nations Human Rights Council, Resolution 7/23: Human Rights and Climate Change (28 March 2008).

[6] Ibid., first line of the resolution.

[7] Simon Caney, 'Climate Change, Human Rights, and Moral Thresholds', in *Human Rights and Climate Change*, ed. Stephen Humphreys, 69-90 (Cambridge; New York: Cambridge University Press, 2009), 71.

threatening human rights, mitigation and adaptation strategies devised to deal with these impacts are also sometimes considered possible threats to human rights.[8] These first two links between climate change and human rights view the latter as being threatened and potentially violated by the impacts of climate change and/or by strategies devised to deal with these impacts.

Human rights are also used in a more positive sense. One year after the publication of resolution 7/23, the Human Rights Council drafted resolution 10/4, which affirmed in the preamble that 'human rights obligations and commitments have the potential to inform and strengthen international and national policymaking in the area of climate change, promoting policy coherence, legitimacy and sustainable outcomes'.[9] The Center for International Environmental Law (CIEL) has emphasized that: 'States must take adequate measures to respect and protect human rights when working to mitigate climate change or adapt to its impacts'.[10] Human rights are therefore also seen as tools to positively inform and influence mitigation and adaptation policies.[11]

Former UN High Commissioner for Human Rights, Mary Robinson, has stated that the principles of human rights 'must be put at the heart of a global deal to tackle global climate change'.[12] Similar language is used by the previous UN Special Rapporteur on the Right to Food, who says that the 'reactive role' of human rights does not suffice. Instead, human rights 'must also become proactive and holistic in warding off human rights violations, and by extension, the advance of climate change at the global level'.[13] Human rights experts recognize a 'core compatibility' between the aims and outcomes in addressing climate change and realizing human rights.[14] The Office of the High Commissioner for Human Rights has also voiced the opinion that decisions taken by States Parties in climate change negotiations should be informed by

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[8] This interrelationship may appear strange, as adaptation and mitigation strategies 'intend to prevent dangerous interferences of climate change with human rights'. However, notwithstanding these intentions, the manner in which mitigation and adaptation strategies are implemented also 'potentially infringe[s] on human rights including the rights to self-determination, life, health, food, water, property, culture and education'. Marcos A. Orellana, 'A Human-Rights Based Approach to Climate Change' in *The Human Rights-Based Approach: A Field of Action for Human Rights Education*, ed. José Parra (Geneva: Cifedhof, 2012), 56. See also: The Center for International Environmental Law (CIEL), 'Climate Change and Human Rights: A Primer', 23 May 2011, http://www.ciel.org/Publications/CC_HRE_23May11.pdf, 9: '… adaptation measures have the potential to infringe on human rights', last accessed on 22 July 2015.

[9] United Nations Human Rights Council, Resolution 10/4: Human Rights and Climate Change (25 March 2009).

[10] CIEL 2011, note 8 above, 1.

[11] See, for instance: John Von Doussa, Allison Corkery, and Renee Chartres, 'Human Rights and Climate Change' *Australian International Law Journal* 14 (2007). 162: 'The human costs of climate change directly threaten fundamental human rights – rights to life, food, to a place to live and work – *rights that governments have an obligation to protect*.' Emphasis added.

[12] Robinson 2008, note 1 above.

[13] De Schutter 2012, note 1 above.

[14] McInerney-Lankford 2009, note 1 above, 437.

international human rights norms and standards.[15] More specifically, proponents of human rights present the application of human rights principles as a way to make adaptation policies more equitable.[16]

These references pertain to 'climate change' and 'human rights' in a very broad sense, and are intended to sketch ways in which these two concepts are related. Climate-ready seeds are presented in this research as a possible adaptation strategy to deal with the adverse impacts on agriculture and crop yields. As human rights law is relevant in general discourse on climate change and adaptation strategies, it is also relevant in discussions on climate-ready seeds. Framing declining agricultural yields and the threat of climate-induced hunger as a problem of human rights can contribute to the sense of urgency that positive action must be taken to address this problem.

Human rights law is relevant not only in identifying the threat of climate change, but also in shaping solutions to climate-related problems. CIEL in a report on climate change and human rights has written that:

> The linkages between climate change and human rights (CC&HRs) are beyond dispute. The challenge now lies in introducing a rights-based approach to the development and implementation of an effective and equitable solution to climate change.[17]

The next section will explain what human rights-based approaches are, and why they are used. This will provide a frame of reference to why and how the right to food is employed in narratives of climate-ready seeds, to be discussed later in the chapter.

1.2 HUMAN RIGHTS-BASED APPROACHES

Human rights-based approaches proliferated from the 1990s onwards.[18] These approaches are associated with development discourse, and are often referred to as rights-based approaches *to*

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[15] United Nations Office of the High Commissioner for Human Rights, 'Applying a Human Rights-Based Approach to Climate Change Negotiations, Policies and Measures' (OHCHR), http://www.ohchr.org/Documents/Issues/ClimateChange/InfoNoteHRBA.pdf, last accessed on 22 July 2015. The OHCHR furthermore states that '[t]his key message is also supported by the United Nations Human Rights Council and by a range of human rights bodies and mechanisms.'

[16] See, for example: Orellana, note 8 above, 54: 'a rights-based approach is central to effective and equitable implementation of climate change policy. It can address the unequal level of economic, social, environmental and human development created by the many, different challenges posed by adaptation to climate change.'

[17] CIEL 2011, note 8 above, 2.

[18] Shannon Kindornay, James Ron, and Charli Carpenter, 'Rights-Based Approaches to Development: Implications for NGOs' *Human Rights Quarterly* 34 (2012), 473. The authors write that: '[W]ithin less than a decade, this new

development.[19] Ellen Dorsey has written that a rights-based approach 'shifts "the tenor of the discourse from charity to entitlement" and elevates development goals to "recognized standards and principles" with enhanced international legitimacy'.[20] Human-rights based approaches intend to give rights holders clear entitlements, and conversely define the obligations of duty bearers to secure those entitlements.[21] The Office of the High Commissioner for Human Rights has stated that rights-based approaches to development must 'contribute directly to the realization of one or several human rights'.[22] Strictly speaking, states are the duty-bearers of international human rights law. The rights-based approach is therefore associated with 'claim-making on the state to secure services'[23] through implementing existing human rights law.

Amartya Sen's theory of rights as entitlements relates closely to the rights-based approach.[24] Tackling poverty through a rights-based approach changes the process from one of charity or aid to the poor, to one in which the poor are entitled to basic standards of living and become active actors with the capacity to assert those entitlements. A rights-based approach views development issues, such as poverty and hunger, as problems of human rights.[25] Reducing hunger and food insecurity is an important part of the international development agenda.[26]

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approach had swept through the websites, policy papers, and official rhetoric of multilateral development assistance agencies, bilateral donors, and nongovernmental organizations (NGOs) worldwide.' Figure 1 on page 475 of Kindornay et al.'s paper shows the increase in English language publications on rights-based approaches to development between 1999 and 2009. See also: Emma Harris-Curtis, 'Rights-Based Approaches-Issues for NGOs' *Development in Practice* 13 (November 2003).

[19] A distinction is sometimes made between 'human rights-based approach' and 'rights-based approach'. While the former specifically denotes the legal framework, the latter also includes broader concepts such as equity and justice. Orellana, note 8 above, 18.

[20] Uwe Gneiting, Tosca Bruno-van Vijfeijken, and Hans Peter Schmitz, 'Setting Higher Goals: Rights and Development – Trade-Offs and Challenges in Implementing a Rights-Based Approach to Development' *Monday Developments* (December 2009).

[21] See, for instance: 'The Human Rights Based Approach to Development Cooperation: Towards a Common Understanding Among UN Agencies', http://hrbaportal.org/the-human-rights-based-approach-to-development-cooperation-towards-a-common-understanding-among-un-agencies#sthash.qiiOplcB.dpuf: 'development of the capacities of 'duty-bearers' to meet their obligations and/or of 'rights-holders' to claim their rights', last accessed on 22 July 2015.

[22] Ibid.

[23] Diana Mitlin and Sheela Patel, 'Re-Interpreting the Rights-Based Approach: A Grassroots Perspective on Rights and Development', ECRC Global Poverty Research Group – WPS-022, June 2005, http://pubs.iied.org/pdfs/G00482.pdf, 10-11, last accessed on 22 July 2015.

[24] Sen writes, specifically in the context of famines, that the entitlement approach concentrates on people's 'ability to command enough food'. Amartya Kumar Sen, *Poverty and Famines: An Essay on Entitlement and Deprivation* (Oxford, New York: Clarendon Press; Oxford University Press, 1981), 46. See also: Chapter 1 at note 16. See also: Elvira Domínguez Redondo, 'The Millennium Development Goals and the Human Rights Based Approach: Reflecting on Structural Chasms with the United Nations System' *The International Journal of Human Rights* 13 (2009), at note 1.

[25] Clear exemplifications of a rights-based approach are the Human Development Reports by the United Nations Development Programme. In these reports, progress in the field of development is measured through international human rights standards. See, for example, the 2000 report, United Nations Development Programme, 'Human Development Report 2000: Human Rights and Human Development' (New York, Oxford: UNDP, 2000).

[26] Charlotte McClain-Nhlapo, 'Implementing a Human Rights Approach to Food Security', a brief prepared for the conference *Assuring Food and Nutrition Security in Africa by 2020: Prioritizing Actions, Strengthening Actors, and Facilitating* Partnerships, Kampala, Uganda, 1-3 April 2004 (International Food Policy Research Institute, 2004).

Rights-based approaches contribute to viewing human rights as part of the solution to problems such as hunger.

Despite the recent proliferation in the use of human rights discourse by NGOs and other civil society organizations, rights-based approaches to human rights have not remained without criticism. One line of criticism relates to a lack of a coherent approach of human rights and development at the UN institutional level.[27] The vagueness of rights-based approaches is also criticized more generally. Although the term 'rights-based approach' is often used in singular form, in fact the same term is adopted by many actors, each attaching a very different meaning to it and application of it. Rights activist and strategist Lisa VeneKlasen and others argue that there is a distortion between the original language and meaning of rights-based approaches to how it is used by many today.[28] For a rights-based approach to be effective, they argue, there must be a solid grounding between human rights, participation, and the daily struggles of peoples for survival and dignity. VeneKlasen et al. contend that:

> In the absence of this grounding, rights-based approaches are merely a new form of technical fix that combines expert-driven social and economic interventions with legal change that may not be relevant to people and communities or engage them as citizens.[29]

In the same vein as human rights law more broadly, a rights-based approach to development has been criticized for being a western construct, for not being universal or equal, and for imposing western views and policies on developing countries.[30] Some critics view the insertion of human rights discourse into the development debate as a development 'fad',[31] as 'moral repackaging' and as 'neoliberal policy agenda-setting tools'.[32] Human rights discourse, according to this criticism, does not lead to empowerment of the poor, but further consolidates the market-based power structures already in place.

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[27] Domínguez Redondo, note 24 above, 39.

[28] Lisa VeneKlasen et al., 'Rights-Based Approaches and Beyond: Challenges of Linking Rights and Participation' *IDS Working Paper 235*, Institute of Development Studies (Brighton 2004).

[29] Ibid., 4

[30] Mohan and Holland write about the potential of a rights-based approach to continue along colonial routes in the context of Africa. They write that: 'as with any ideological venture led by the major international development agencies, the potential exists for the rights-based agenda to be used as a new form of conditionality which usurps national sovereignty and thereby further denies the autonomy and freedom which are a *sine qua non* for democratic development'. Giles Mohan and Jeremy Holland, 'Human Rights & Development in Africa: Moral Intrusion or Empowering Opportunity?' *Review of African Political Economy* 28 (2001), 192-193.

[31] Kindornay et al., note 18 above, 474.

[32] Hillary Ferguson, 'The Right to Development and the Rights-Based Approach to Development: A Review of Basic Concepts and Debates' Occasional Paper No. 1 (New Dehli: Centre for Development and Human Rights, 2011), 8.

Human rights and rights-based approaches are relevant also in critical debates about neoliberalism. Human rights are sometimes considered to 'provide some sort of moral leverage against neoliberal developments'.[33] While neoliberalism supports a strong free-market and promotes competition,[34] human rights-based approaches purport to focus on individual rights, on participation, and on marginalized communities. Paul O'Connell indicates the 'irreconcilability' of neoliberalism and human rights, stating that '[t]he normative foundations of neo-liberalism are in complete contrast with those underpinning the idea of fundamental human rights'.[35] The criticisms of rights-based approaches as described above are also pertinent in relation to neoliberalism. Samuel Moyn writes that the value of human rights as an opposition to neoliberalism 'amounts to little more than a set of mostly rhetorical admonitions'.[36]

Human rights language is often invoked in movements that seek to counter 'neoliberal globalization', what O'Connell refers to as 'subaltern globalization'.[37] The main argument of O'Connell's assessment on the irreconcilability between human rights and neoliberalism, is that 'only a movement such as this [referring to subaltern globalization], utilising human rights as tools for political mobilisation as much as anything else, which will insure the protection of human rights in a globalised world'.[38] In a similar vein, David Harvey argues that opposition to neoliberalism 'tends to accept many of the basic propositions of neoliberalism',[39] but then concludes that it would be 'unfortunate to abandon the field of rights to neoliberal hegemony'.[40] There remains, therefore, a belief that human rights-based approaches can serve to achieve developments goals, if applied correctly.

Human rights and rights-based approaches have proliferated in recent decades, and have been both heralded and criticized, for instance as part of counter movements to neoliberalism. The next section will elaborate on the right to food, and how this right is relevant and invoked in different narratives of climate-ready seeds.

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[33] Samuel Moyn, 'A Powerless Companion: Human Rights in the Age of Neoliberalism' *Law and Contemporary Problems* 77 (2014), 151.
[34] See references to neoliberalism in Chapter 1, section 2.2.
[35] Paul O'Connell, 'On Reconciling Irreconcilables: Neo-Liberal Globalisation and Human Rights' *Human Rights Law Review* 7 (2007), 497.
[36] Moyn, note 33 above, 151.
[37] O'Connell, note 35 above, 494. Chapter 1, section 2.3 set out food sovereignty movements as resistance against the neoliberal tendencies in the current food regime. Food sovereignty movements can be viewed as 'subaltern globalization' as described by O'Connell.
[38] Ibid., 509.
[39] David Harvey, *A Brief History of Neoliberalism* (Oxford: Oxford University Press, 2007), 175.
[40] Ibid., 179. Also cited by O'Connell, note 35 above, 508.

2 THE RIGHT TO FOOD IN NARRATIVES OF CLIMATE-READY SEEDS

After having presented the broad link between climate change and human rights, and introduced human rights-based approaches, this part of the chapter will explore the role that the right to food plays in narratives of climate-ready seeds. It will first present the emergence and development of the right to food. Subsequently, the second section will analyse the relevance and use of this right in different accounts of climate-ready seeds.

2.1 THE RIGHT TO FOOD AS A LEGAL SOLUTION TO HUNGER

Chapter 1 articulated that the lack of adequate production and access to food has, since the 1970s, been framed as a problem of food insecurity and hunger.[41] The moral rhetoric that something needs to be done to eliminate hunger has been present in different forms throughout history. This section will argue that the fight against hunger has transformed into being not merely moral rhetoric, but enveloping also legal obligations through the human right to food. The right to food has become a language through which to address hunger, as a legal solution to hunger.

The Universal Declaration of Human Rights (UDHR) of 1948[42] included the right to adequate food.[43] The International Covenant on Economic, Social and Cultural Rights (ICESCR)[44] of 1976 explicitly recognized the right to adequate food.[45] In 1998, the Committee on Economic, Social, and Cultural Rights drafted a General Comment on the right to food in an

[41] See Chapter 1, section 1.3.
[42] United Nations General Assembly, Universal Declaration of Human Rights (UDHR) (10 December 1948).
[43] UDHR, article 25(1): 'Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.'
[44] United Nations General Assemby Resolution 2200A, International Covenant on Economic, Social and Cultural Rights (ICESCR) (3 January 1976).
[45] ICESCR, article 11: '1. The States Parties to the present Covenant recognize the right of everyone to an adequate standard of living for himself and his family, including adequate food, clothing and housing, and to the continuous improvement of living conditions. The States Parties will take appropriate steps to ensure the realization of this right, recognizing to this effect the essential importance of international co-operation based on free consent.
2. 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.'

effort to make this right more concrete and operational.[46] In further efforts to examine human rights situations in countries and specific themes related to human rights more in-depth, the UN created various special mechanisms to examine specific issues from 1979 on. The UN Human Rights Council commissioned experts to examine specific human rights issues, including the human right to food. The mandate of the Special Rapporteur on the Right to Food was established in 2000, with the aim to look into issues relating to:

> [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 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.[47]

The right to food, as this definition illustrates, encompasses the aspects of accessibility that are also highlighted in definitions of food security. Preventing hunger through the right to food is based on adequate availability of food, but also, and importantly, on adequate access to available food, in the present as well as in the future.[48] Former UN Special Rapporteur on the Right to Food, Olivier De Schutter, covered a great deal of ground in recent years with respect to further unpacking, and making attempts to put into practice, the right to food. He, among others, worked to define what the entitlements and obligations are under the right to food, and has referred to the right to food as 'a compass to ensure that policies are geared towards alleviating hunger and malnutrition'.[49]

In 2004, the Food and Agriculture Organization Council adopted the 'Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security'.[50] These guidelines represent a step towards 'integrating human rights into the work of agencies dealing with food and agriculture'.[51] Although the right to food as a

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[46] United Nations Economic and Social Council, CESR General Comment 12: The Right to Adequate Food (Article 11) E/C.12/2000/4 (12 May 1999).
[47] Office of the United Nations High Commissioner for Human Rights, 'Special Rapporteur on the Right to Food', http://www.ohchr.org/EN/Issues/Food/Pages/FoodIndex.aspx, last accessed on 22 July 2015.
[48] See also Chapter 1, section 1.2 on defining food (in)security.
[49] Olivier De Schutter – United Nations Special Rapporteur on the Right to Food, 'Briefing Note 01: Countries Tackling Hunger with a Right to Food Approach – Significant Progress in Implementing the Right to Food at National Scale in Africa, Latin America and South Asia' (May 2010).
[50] Food and Agriculture Organization, 'Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security' (Rome: FAO, 2005), ftp://ftp.fao.org/docrep/fao/meeting/009/y9825e/y9825e.pdf, last accessed on 22 July 2015.
[51] Ibid., iii.

separate legal concept is still in a relatively early phase of development, it has gained a lot of attention in recent years. Framing the fight against hunger in terms of the right to food adds an important legal dimension to solutions for hunger. Applying a rights-based approach to hunger signifies that 'people have a *fundamental right* to be free from hunger'.[52]

In 2009, De Schutter published a report with the aim of exploring how states can implement seed policies that 'contribute to the full realization of human rights', and how commercial seed systems can be regulated in order to 'serve the right to food'.[53] This report formulated a rights-based approach to seed policies as follows:

> [A human-rights based approach] obliges us to ask not only which policies may maximize yields – agricultural outputs – but also, and primarily, who will benefit from any increases achieved by whichever policies are put in place. The right to food requires that we place the needs of the most marginalized groups, including in particular smallholders in developing countries, at the centre of our efforts.[54]

The right to food has also explicitly come to be linked explicitly to the impacts of climate change on agriculture and food security. A report issued in 2009 by the Columbia Law School Human Rights Institute states that '[C]limate change has overwhelming repercussions for international food security and the right to adequate food'.[55] The authors of this report, under the supervision of Olivier De Schutter, promote 'the added value of a human rights perspective'[56] and 'applying the rights-based approach to the right to food in the context of climate change'.[57] Oxfam International states that a right to food approach can influence adaptation strategies, for instance by '[c]reat[ing] appropriate, affordable, and accessible technologies for adaptation, such as … drought-tolerant seeds … to help poor people adapt effectively'.[58] Caney has argued that

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[52] The Food and Agriculture Organization, 'The Right to Food', http://www.fao.org/worldfoodsummit/english/fsheets/food.pdf, last accessed on 22 July 2015. Emphasis added.
[53] Olivier De Schutter, 'The Right to Food: Seed Policies and the Right to Food: Enhancing Agrobiodiversity and Encouraging Innovation' (United Nations General Assembly, 2009), 2.
[54] Ibid.
[55] Elisabeth Caesens and Maritere Padilla Rodriguez, 'Climate Change and the Right to Food: A Comprehensive Study' in *Heinrich Boll Stiftung Publication Series on Ecology* ed. Heinrich Boll Foundation, Volume 8 (Berlin: Columbia Law School – Human Rights Institute, 2009), 14, https://www.boell.de/sites/default/files/Series_Ecology_Volume_8_Climate_Change_and_the_Right_to_Food_0.pdf, last accessed on 22 July 2015. The authors of the report continue to note that: 'Changing weather patterns impact people's ability to obtain access to sufficient food in many ways', for instance that 'expanding droughts affect crop yields'. Also at page 14.
[56] Ibid., section 1.3 at page 41.
[57] Ibid., section 1.3.2 at page 42.
[58] Oxfam International, note 1 above, 23.

'temperature increases will lead to drought and thereby undermine food security',[59] and presented this as part of the threat to the human right to subsistence.

The right to food has proliferated in scope and application, both in general and in relation to rights-based approaches to climate change. The next sections will analyse how right to food approaches are relevant to, and invoked in, different narratives of climate-ready seeds.

2.2 RIGHT TO FOOD APPROACH IN CRITICAL NARRATIVES OF CLIMATE-READY SEEDS

NGOs and civil society organizations that are critical of climate-ready seeds invoke the right to food frequently. This narrative employs the right to food in different ways, including general commitments to human rights, explicit references to the right to food, and implicit endorsements of right to food approaches. This section will argue that the critical narrative of climate-ready seeds draws on the right to food as a means to resist the corporate domination of climate-ready seeds.

In disclaimers to their reports, the ETC Group states that they look at issues 'from a human rights perspective' and investigate the 'erosion' of human rights.[60] La Via Campesina also names human rights as one of its main issues.[61] Priscilla Claeys has analysed how La Via Campesina uses human rights, stating that the agrarian movement 'is known for having successfully mobilized a human rights discourse in its struggle against capitalism and neoliberalism in agriculture'.[62] La Via Campesina has also criticized the power of agricultural corporations such as Monsanto against the backdrop of climate change by referring to 'human rights violations' by these corporations and simultaneously presenting 'land rights', 'community rights', and 'food rights' as ways to counter these violations.[63]

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[59] Caney, note 7 above, 81.

[60] ETC Group, 'Patenting the "Climate Genes" … and Capturing the Climate Agenda' (ETC Group, 2008): 'We look at issues from a human rights perspective but also address global governance and corporate concentration.' ETC Group, 'Capturing "Climate Genes": Gene Giants Stockpile Patents on "Climate-Ready" Crops in Bid to Become "Biomassters"' (ETC Group, 2010): 'We investigate ecological erosion (including the erosion of cultures and human rights), the development of new technologies, and we monitor global governance issues including corporate concentration and trade in technologies.'

[61] La Via Campesina, 'Human Rights', http://viacampesina.org/en/index.php/main-issues-mainmenu-27/human-rights-mainmenu-40, last accessed on 22 July 2015.

[62] Priscilla Claeys, 'From Food Sovereignty to Peasants' Rights: an Overview of Via Campesina's Struggle for New Human Rights', http://viacampesina.org/downloads/pdf/openbooks/EN-02.pdf, 1, last accessed on 22 July 2015.

[63] Joseph Zacune, 'Combatting Monsanto Grassroots Resistance to the Corporate Power of Agribusiness in the Era of the "Green Economy" and a Changing Climate' ed. La Via Campesina (La Via Campesina; Friends of the Earth International; Combat Monsanto, March 2012).

Claeys highlights the limitations of human rights-based approaches,[64] noting that these limitations can 'seriously hinder the subversive potential of human rights'.[65] La Via Campesina has for this reason articulated 'new' human rights, for instance the 'right to food sovereignty' instead of the right to food.[66] The ETC Group likewise asserts the 'rights of peoples' to define their food policies.[67] Navdanya also promotes the right to food; for instance, this organization was part of a group that drafted the People's Charter for Food and Nutrition Security in 2009, aiming to 'understand the global and national causes of hunger and malnutrition as well as to evolve strategies to strengthen efforts to secure the human right to food'.[68] These prominent civil society organizations, while also recognizing the limitations of human rights-based approaches, still frequently draw on human rights.

The voices feeding the critical narrative of climate-ready seeds also implicitly endorse human rights and right to food approaches, for instance by adopting specific understandings of food security. In 2012, when the first Global Strategic Framework for Food Security and Nutrition[69] was drafted by the Committee on World Food Security,[70] La Via Campesina issued a press release entitled 'The Right to Food is now the Basis for Food Security Framework Policy'.[71] The reports of the ETC Group about climate-ready seeds also refer to the concept of food security, highlighting the importance of adequate access to and distribution of food.[72] Although the term right to food is not used expressly in these ETC reports that criticize climate-ready seeds, the emphases on rights and access and distribution of food are in line with the scope of that human right.

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[64] Including that human rights are a western construct and do not adequately take into account the role of non-state actors as duty-bearers. Claeys, note 62 above, 2.

[65] Ibid., 2.

[66] See, for instance: Priscilla Claeys, 'Vía Campesina's Struggle for the Right to Food Sovereignty: From Above or from Below?' in *Rethinking Food Systems: Structural Challenges, New Strategies and the Law*, 29-52, ed. Nadia Lambek, Priscilla Claeys, Adrienne Wong, and Lea Brilmayer (Springer, 2014).

[67] See, for example: ETC Group, 'Farmers' Rights and Food Sovereignty', http://www.etcgroup.org/issues/farmers-rights-food-sovereignty, last accessed on 22 July 2015.

[68] Navdanya, 'The Right to Food', http://navdanya.org/campaigns/right-to-food, last accessed on 22 July 2015.

[69] This framework was made with the objective 'to improve coordination and guide synchronized action by a wide range of stakeholders in support of global, regional and country-led actions to prevent future food crises, eliminate hunger and ensure food security and nutrition for all human beings'. Committee on World Food Security, 'The Global Strategic Framework for Food Security and Nutrition' (2012), http://www.fao.org/cfs/cfs-home/global-strategic-framework/en/, last accessed on 22 July 2015.

[70] The Committee on World Food Security was created in 1974 as an intergovernmental body under the auspices of the UN, with the purpose of monitoring and reviewing policies related to global food security. Ibid.

[71] La Via Campesina, 'La Via Campesina Press Release: The Right to Food Is Now the Framework for the Food Security Framework Policy', http://viacampesina.org/en/index.php/main-issues-mainmenu-27/food-sovereignty-and-trade-mainmenu-38/1318-the-rights-to-food-are-now-the-basis-for-the-food-security-framework-policy, last accessed on 22 July 2015.

[72] In 'Patenting the "Climate Genes" … and Capturing the Climate Agenda', the ETC Group reinforces the idea that climate change will affect food security and that agricultural biodiversity can contribute to realizing food security, especially pages 2, 10, 11, and 14. Similar references are made in 'Capturing "Climate Genes": Gene Giants Stockpile Patents on "Climate-Ready" Crops in Bid to Become "Biomassters"', especially pages 4, 22, and 29.

A more recent report by the ETC Group, which critiques Gene Giants and the seed monopoly, explicitly refers to the right to food and to the work of the former Special Rapporteur.[73] One of the main recommendations in this report is as follows: 'The world needs agricultural biodiversity to achieve the Right to Food and respond to the challenges of climate chaos. National governments and UN agencies must take urgent action.'[74] Naomi Klein has also explicitly linked climate-ready seeds with the right to food. In an interview with news program *Democracy Now!*, Klein spoke critically about the way in which agricultural biotechnology corporations are patenting climate-resilient seeds and crops. She argued that the discussion on climate-ready seeds 'needs to be about the right to food, about food being a human right'.[75] Klein's use of human rights language in this context echoes the previous Special Rapporteur's comments and the discourse by prominent NGOs. This type of language portrays support for rights-based approaches to ending hunger in the face of climate change.

The narrative that does not believe that climate-ready seeds can contribute to combating hunger in the face of climate change plainly draws on human rights and right to food discourse. Although the voices in this narrative recognize the limitations of human rights, they frequently employ the right to food as a means to bring the issues of hunger, food insecurity, and the most vulnerable peoples back to the centre of attention. The next section will discuss the relevance of human rights, and especially the right to food, in the perspective of seed corporations.

2.3 THE RELEVANCE OF RIGHT TO FOOD DISCOURSE FOR GENE GIANTS

Seed corporations, and other actors that promote climate-ready seeds as a means to combat hunger in the face of climate change, do not invoke the human right to food explicitly. Nevertheless, human rights law and the right to food are relevant for this narrative. This section will argue that human rights law increasingly recognizes that corporations are human rights actors, that these corporations present their commitment to human rights, and that the way in which climate-ready seeds are promoted can be viewed in line with the right to food.

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[73] ETC Group, 'Gene Giants Seek "Philanthrogopoly"' (ETC Group Communiqué, Issue #110, March 2013). For instance, this report states that: 'The Special Rapporteur should be invited to explore the private sector's role in other multilateral agencies related to food and agriculture – including CGIAR, which should also invite the Special Rapporteur to undertake a study of how the CG system is addressing the Right to Food', 1.

[74] Ibid., 1.

[75] 'And so, I think people need to identify this right away, and the discussion needs to be about the right to food, about food being a human right. This is far too important to allow players like Monsanto to privatize the future of the crops that can grow within a context of climate change.' Democracy Now! 'With Crises in Fuel, Food, Housing and Banking, What Gvt. Policies Are Being Pushed Through? Naomi Klein Reexamines "the Shock Doctrine"'. An interview with Naomi Klein on *Democracy Now!*, 15 July 2008, http://www.democracynow.org/2008/7/15/with_crises_in_fuel_food_housing, last accessed on 22 July 2015.

Although the duty bearers of international law are States Parties, there is increasing recognition that private sector actors can also play a role in respecting, protecting, and fulfilling obligations under human rights law.[76] General Comment 12 of the Committee on Economic, Social, and Cultural Rights, which elaborates on the right to food, specifies that States Parties are under the obligation to 'take appropriate steps to ensure that activities of the private business sector and civil society are in conformity with the right to food'.[77] The private sector has no obligations under human rights law, but there is nevertheless recognition that it may be involved in contributing to the realization of the right to food. The Office of the High Commissioner for Human Rights, in pursuing a common definition of a human rights-based approach to development, writes of 'the relationship between individuals and groups with valid claims (rights-holders) and State *and non-state actors* with correlative obligations (duty-bearers)'.[78]

Discussion in Chapter 2 of this thesis argued that climate change adaptation law is increasingly welcoming of private sector engagement,[79] and the first part of this chapter outlined that human rights language is increasingly being inserted into climate change discourse.[80] An Oxfam International report on climate change and human rights contains a section entitled: 'The private sector: what role on rights and climate change?'[81] The authors write that:

> Human-rights obligations fall primarily on states, and part of every state's responsibility is to protect people's rights by regulating private-sector activity. At the same time, all companies have an obligation to ensure that their activities do not undermine human rights. This requires them to monitor and report on the impacts of their operations, and to take all necessary steps to avoid negative impacts. Leading companies are going further, promoting the fulfilment of rights through their corporate operations.[82]

The large agricultural biotechnology corporations have taken heed of their human rights responsibilities; most obviously, they have policy statements publicly available on their websites

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[76] This is evidenced, for example, in the UN Guiding Principles on Business and Human Rights: United Nations Office of the High Commissioner for Human Rights, 'Guiding Principles on Business and Human Rights: Implementing the United Nations "Protect, Respect and Remedy" Framework', New York and Geneva 2011, http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf, last accessed on 22 July 2015. Also known as the 'Ruggie Principles'.

[77] CESR General Comment 12: The Right to Adequate Food (Article 11), note 46 above.

[78] 'The Human Rights Based Approach to Development Cooperation: Towards a Common Understanding Among UN Agencies', http://hrbaportal.org/the-human-rights-based-approach-to-development-cooperation-towards-a-common-understanding-among-un-agencies#sthash.qiiOplcB.dpuf, last accessed on 22 July 2015. Emphasis added.

[79] See Chapter 2, part 3.

[80] See section 1.1 above.

[81] Oxfam International, note 1 above.

[82] Ibid., 22. See also Ruggie Principles, note 76 above.

that without exception refer to human rights. These policy statements often mention the UDHR.[83] Monsanto's human rights policy states that the company 'is committed to the protection and advancement of human rights'.[84] BASF also expresses a commitment to observe the principles of other human rights treaties, including the ICESCR.[85] This shows that, at least superficially, seed corporations are also invoking human rights.

Seed corporations do not appeal to the right to food directly. However, the way in which genetically engineered climate-resilient seeds and crops are presented – both by seed corporations themselves and by others – can be viewed in terms of the right to food. As the initial presentation of this narrative in Chapter 1 indicated, phrases such as 'feeding the world' and 'filling tomorrow's rice bowl' are used.[86] Seed corporations do not literally say: Climate-ready seeds contribute to securing everyone's human right to food. Nevertheless, by framing the need for developing climate-ready seeds in terms of feeding the world and addressing hunger in the face of climate change, this narrative implicitly draws on human rights discourse.

Further discourse about climate change and human rights also adds to setting the scene for seed corporations as active participants in realizing the right to food. The previously mentioned report by De Schutter on seed policies and the right to food promotes right to food approaches, and also recognizes the 'considerable contribution' scientific research can make to improving seeds and increasing agricultural production.[87] A report by the International Council on Human Rights Policy discusses ways in which a 'human rights framing may help orient and motivate policy' related to climate change adaptation technologies.[88] Chapter 5 of this report looks at the right to food and agricultural adaptation technologies. The central idea in both reports seems to be to apply human rights-based approaches to improve the effectiveness of agricultural technologies for climate change adaptation and seed policies.

When employing right to food approaches, critical narratives often highlight the importance of access to food. Legal texts stipulating the right to food, however, also emphasize

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[83] BASF, 'BASF Group's Position on Human Rights', https://www.basf.com/documents/corp/en/sustainability/employees-and-society/human-rights/BASF_Human_Rights_Position.pdf, last accessed on 22 July 2015; Bayer, 'Bayer Human Rights Position', http://www.bayer.com/en/bayer-human-rights-position.aspx, last accessed on 22 July 2015; Syngenta, 'Human Rights', http://www.syngenta.com/global/corporate/en/about-syngenta/governance/code-of-conduct/Pages/human-rights.aspx, last accessed on 22 July 2015.

[84] Monsanto, 'Monsanto Human Rights Policy' (Adopted by the Board 19 April 2006), http://www.monsanto.com/sitecollectiondocuments/human-rights-policy.pdf, last accessed on 22 July 2015.

[85] BASF, note 83 above, at section 1 on page 1 under 'Commitments'.

[86] See Chapter 1, section 3.2.1.

[87] De Schutter 2009, note 53 above, 9.

[88] International Council on Human Rights Policy, 'Beyond Technology Transfer Protecting Human Rights in a Climate-Constrained World' (Geneva, Switzerland: International Council on Human Rights Policy, 2011), 81.

the importance of adequate food production. Article 11.2(a) of the ICESCR stipulates that states are required to take the following measures to contribute to realizing the right to food:

> 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*.[89]

Seed corporations present climate-ready seeds as a method to improve food production by making use of technical and scientific knowledge. It can also be argued that developing higher yielding crops is an efficient utilization of natural resources, and that states should support seed corporations' endeavours to this end. Although seed corporations do not make these arguments explicitly, the right to food could be interpreted in a way that is favourable for the development and promotion of climate-ready seeds.

Narratives of climate-ready seeds by seed corporations implicitly benefit from right to food discourse, which recognizes the role of the private sector, the need to improve food production methods, and the value of agricultural technologies. Critical narratives do not present climate-ready seeds in themselves as being incompatible with the right to food. On the contrary, they imply that, with the insertion of right to food standards, seed policies – including climate-ready seeds – could contribute to fighting food insecurity and hunger. The right to food as relevant and invoked in contradictory narratives of climate-ready seeds reflects distinctive perspectives on how to achieve food security, either through a 'neoliberal' free market or through food sovereignty movements.[90]

This part of the chapter has discussed the right to food generally. One of the biggest contentions related to climate-ready seeds is the growing number of corporate patent applications. The next part of this chapter will study the relationship between patent rights and the right to food in narratives of climate-ready seeds.

[89] Article 11.2(a) ICESCR, note 45 above. Emphases added.
[90] See Chapter 1 for a discussion of food security (especially section 1.1) and food sovereignty (especially section 2.3).

3 SEED PATENTS AND THE RIGHT TO FOOD

This last part of the chapter will focus on the way in which the right to food is employed as a response to growing patent applications on climate-ready seeds. The first section will sketch the relationship between intellectual property rights and human rights, and explain the main ways in which the two fields interact. The perceived dispute between the right to patent genetically modified seeds and the right to food is set within a much larger debate about intellectual property rights and human rights. The second section will subsequently discuss seed patents and the right to food. The main argument in this section is that the right to food is used primarily in efforts to direct patented climate-ready seeds towards combating hunger, as a necessary correction rather than an inherent contradiction to patent rights.

3.1 INTELLECTUAL PROPERTY RIGHTS AND HUMAN RIGHTS

The legal regimes of intellectual property rights and human rights materialized separately from each other, and historically, the relationship between the two is not immediately evident.[91] The expansions of both legal regimes in recent years have, however, brought to the fore linkages as well as tensions between them.[92] The expanding subject-matter of intellectual property protection and the emergence of an international framework of intellectual property protection, as materialized in the TRIPS Agreement, were two important conditions that aroused the interest of human rights lawyers.[93] This 'interest', for the most part, constituted a critical analysis.[94] The TRIPS Agreement marked a significant strengthening of international intellectual property protection. In the years following 1994, there was much debate about the balance between intellectual property rights and human rights.

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[91] Peter Drahos has called the connection between them 'thin at best'. Peter Drahos, 'Intellectual Property and Human Rights' *Intellectual Property Quarterly* 3 (1999), 357.

[92] Laurence R. Helfer, 'Human Rights and Intellectual Property: Conflict or Coexistence' *Minnesota Intellectual Property Review* 5 (2003), III.A.

[93] See, for example: UN Commission on Economic, Social and Cultural Rights 'Statement by the UN Commission on Economic, Social and Cultural Rights: Substantive Issues Arising in the Implementation of the International Covenant on Economic, Social and Cultural Rights: Human Rights and Intellectual Property' E/C.12/2001/15, 14 December 2001.

[94] Ibid., in paragraph 1 the Commission states that intellectual property protection 'can afford for promoting or inhibiting the enjoyment of human rights'. In paragraph 18 of the conclusion, the Commission writes: 'The Committee considers of fundamental importance the integration of international human rights norms into the enactment and interpretation of intellectual property law. Consequently, States parties should guarantee the social dimensions of intellectual property, in accordance with international human rights obligations to which they have committed themselves. An explicit commitment to do so and the establishment of a mechanism for a human rights review of intellectual property systems are important steps towards that goal.' See also: the report of the UN Sub-Commission, note 96 below.

The former UN Sub-Commission on the Promotion and Protection of Human Rights[95] published a report, in 2000, exploring the relationship between intellectual property law and human rights law.[96] The Sub-Commission's main contention was that there are 'apparent conflicts between the intellectual property rights regime embodied in the TRIPS Agreement, on the one hand, and international human-rights law, on the other'.[97] This presumed conflict between the two legal regimes becomes more tangible when specific examples are provided.

Human rights proponents often argue that the balance is skewed in favour of the patent-holders, and does not contribute to realizing everybody's human rights, or even undermines these rights.[98] After the sub-commission's report, the UN passed a number of resolutions on the access to AIDS medicines, and analysed the relationship between TRIPS and the right to health more closely.[99] The example of drug patents and the right to health is relevant in understanding how early tensions between intellectual property rights and human rights were addressed. The human rights documents illustrate right to health approaches to drug patents, in attempts to increase access to medicines through incorporating right to health standards.[100] Laurence Helfer describes the contradictions between drug patents and the right to health as follows:

> On one side of this contested terrain are multinational pharmaceutical companies and the industrialized countries in which they are based, which argue that strong patent protection is essential to incentivizing medical research and development. On the other side are public interest NGOs and developing country negotiators (including those from

[95] This UN Sub-Commission was first formed in 1947 and was a think tank functioning under the UN Commission on Human Rights. Its primary functions were to 'undertake studies on human rights issues, to make recommendations concerning the prevention of discrimination of any kind relating to human rights and fundamental freedoms and the protection of racial, national, religious and linguistic minorities, and to carry out any other functions which may be entrusted to it'. As of 2006, the work of the sub-commission was taken over by the UN Human Rights Council. See, for more information: Office of the United Nations High Commissioner for Human Rights, 'Sub-Commission on the Promotion and Protection of Human Rights', http://www2.ohchr.org/english/bodies/subcom/, last accessed on 22 July 2015.

[96] Sub-Commission on the Promotion and Protection of Human Rights, 'Intellectual Property Rights and Human Rights' Fifty-Second Session, Agenda Item 4, E/CN.4/Sub.2/2000/7 (Adopted 17 August 2000).

[97] Ibid.

[98] See, for example: Drahos 1999, note 91 above, especially at pages 351 and 357. See also: United Nations Economic and Social Council, General Comment 17: The Right of Everyone to Benefit from the Protection of the Moral and Material Interests Resulting from Any Scientific, Literary or Artistic Production of Which He or She Is the Author (Article 15, Paragraph 1 (C), of the Covenant) E/C.12/GC/17, 12 January 2006, para 35.

[99] See, for example: UN Human Rights Council, 'Report of the Special Rapporteur on the Right of Everyone to the Enjoyment of the Highest Attainable Standard of Physical and Mental Health' A/HRC/11/12 (31 March 2009) for a report of the links between TRIPS and the right to health; and Office of the United Nations High Commissioner for Human Rights, 'The Protection of Human Rights in the Context of Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS)' E/CN.4/Res/2005/84 (2005) for one of the resolutions specifically on AIDS and access to medicines.

[100] See, for instance: Laurence R. Helfer, 'Pharmaceutical Patents and the Human Right to Health: The Contested Evolution of the Transnational Legal Order on Access to Medicines' in *Transnational Legal Orders*, ed. Terrance Halliday and Greg Shaffer, 311-339 (Cambridge, UK: Cambridge University Press 2014).

> Brazil, India, South Africa, and several nations in Latin America), which invoke the human right to health to justify restricting pharmaceutical patents, facilitating the manufacture of cheaper generic copies, and maximizing the distribution of life-saving medicines to millions of the world's poor.[101]

The TRIPS Agreement, notably article 27 thereof, has significantly expanded the possibilities to apply patent rights on newly developed drugs.[102] The tensions between drug patents and the right to health are closely related to the objective of intellectual property rights, namely to reward and incentivize innovation, on the one hand, and to benefit society, on the other.[103] As a result of the debates about drug patents and the right to health, the WTO adopted the Declaration on the TRIPS Agreement and the Right to Health, in 2001.[104] This declaration states that 'while reiterating our commitment to the TRIPS Agreement, we affirm that the Agreement can and should be interpreted and implemented in a manner supportive of WTO members' right to protect public health and, in particular, to promote access to medicines for all'.[105] The declaration allowed the granting of compulsory licensing, 'when a government allows someone else to produce the patented product or process without the consent of the patent owner',[106] in response to national health emergencies.[107] Some countries have classified AIDS as a national health emergency.[108]

The discussions about drug patents and the right to health have brought to light the contentious relationship between intellectual property rights and human rights, and a number of approaches have emerged about how to deal with this contentious relationship. Helfer has identified two main approaches.[109] One holds that intellectual property law and human rights law

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[101] Ibid., 311.
[102] Ibid, 322.
[103] See Chapter 3, especially Fisher at note 40.
[104] World Trade Organization, 'Declaration on the TRIPS Agreement and Public Health' WT/MIN(01)/DEC/220 November 2001. Adopted on 14 November 2001, https://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_trips_e.htm, last accessed on 22 July 2015. Also known as the 'Doha Declaration', as it was adopted at the WTO ministerial meeting in Doha.
[105] Ibid, at paragraph 4.
[106] World Trade Organization, 'Compulsory Licensing of Pharmaceuticals and TRIPS', https://www.wto.org/english/tratop_e/trips_e/public_health_faq_e.htm, last accessed on 22 July 2015.
[107] Helfer 2014, note 100 above, 330.
[108] Kenya declared AIDS to be a national health emergency, see World Health Organization, 'Kenya', December 2005, http://www.who.int/hiv/HIVCP_KEN.pdf, last accessed on 22 July 2015. Other countries, including Brazil, Zambia, Mozambique, Cameroon, Zimbabwe, Ghana, and Eritrea have also requested compulsory licenses on the basis of national health emergencies. See: Consumer Project on Technology, 'Examples of Health-Related Compulsory Licenses', http://www.cptech.org/ip/health/cl/recent-examples.html, last accessed on 22 July 2015. Consumer Project on Technology is now known under the name Knowledge Ecology International (http://www.keionline.org/).
[109] Helfer 2003, note 92 above, 48-49.

are fundamentally conflicting, and that this conflict can be resolved by recognizing the superiority of human rights over intellectual property rights.[110] Geertrui Van Overwalle writes that human rights can form a barrier for the coming into existence of patent rights.[111] This view is also in part put forward in the report by the UN Sub-Commission cited previously. In this report, the Commission '[r]eminds all Governments of the primacy of human rights obligations over economic policies and agreements'.[112] The Commission's view is less explicit than Van Overwalle's statement, but nevertheless acknowledges that human rights standards must not be threatened by 'economic policies and agreements'. Another view is that intellectual property rights *per se* do not undermine human rights, but rather that an unjust balance in the two-pronged objective of patent rights does so.[113]

In a second approach, intellectual property rights and human rights are held to be not incompatible and able to coexist, as long as a workable balance between the two is found.[114] The granting of compulsory licenses in the context of a national health emergency in the case of drug patents and the right to health can be seen as an example of seeking a workable balance. In the context of agricultural patents and the right to food, Van Overwalle writes that '[h]uman rights serve as a counter balance of patent rights when centering too one-sidedly on trade, access to markets and economic calculus'.[115] She further argues that patent law must be 'inextricably linked with human rights discourse' in order to receive widespread acceptance.[116] Intellectual property law, in this perspective, cannot function properly without also applying a human rights

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[110] For example, the previous Special Rapporteur on the Right to Food writes that it would be 'inappropriate to frame the issue as one of human rights in conflict with one another. Instead, a clear distinction should be made between human rights and the granting of monopoly privileges as IP [intellectual property] rights.' De Schutter 2009, note 53 above, 5.

[111] Geertrui Van Overwalle, 'Patents in Agricultural Biotechnology and the Right to Food', a paper commissioned by the UN Human Right Council Special Rapporteur, Olivier De Schutter, for the Scientific Report on Intellectual Property Rights and Right to Food, April 2009, 6. One major issue with this approach is that intellectual property protection is also stipulated as a human right in article 27(2) of the UDHR and article 15(1) of the ICESCR.
Article 27(2) UDHR: 'Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author.'
Article 15(1) ICESCR: 'The States Parties to the present Covenant recognize the right of everyone: (a) To take part in cultural life; (b) To enjoy the benefits of scientific progress and its applications; (c) To benefit from the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author.' See also: Audrey R. Chapman, 'Approaching Intellectual Property as a Human Right: Obligations Related to Article 15 (1) (C)' *Copyright Bulletin*, UNESCO Publishing XXXV 3 (2001).

[112] Sub-Commission on the Promotion and Protection of Human Rights, note 96 above, at para 3.

[113] UN Commission on Economic, Social, and Cultural Rights, 'Statement by the UN Commission on Economic, Social and Cultural Rights: Substantive Issues Arising in the Implementation of the International Covenant on Economic, Social and Cultural Rights: Human Rights and Intellectual Property' E/C.12/2001/15, 14 December 2001.

[114] Helfer 2003, note 92 above, 89.

[115] Van Overwalle, note 111 above, 5.

[116] Ibid.

framework.[117] Such an approach does not view patent rights and human rights as necessarily conflicting. Rather, it argues that patent rights and human rights can work together to achieve the same goals, on the condition that human rights standards are appropriately incorporated into policies. Helfer likewise argues for the need to have an effective 'human rights framework' for intellectual property rights.[118]

At the end of his article, Helfer sketches three possible future scenarios of the interaction between intellectual property law and human rights law. He suggests the following options: property law will expand further at the expense of human rights; human rights will serve as a tool to limit the scope of intellectual property rights; or, finally, intellectual property law will serve to promote human rights.[119] The overarching relationship between intellectual property rights and human rights and the different approaches and future scenarios of the interaction between the two fields of law are relevant in discussing the right to food in narratives of climate-ready seeds. Which approach is dominant, and which future scenario is likely to occur on the basis of discussions on climate-ready seeds?

3.2 THE RIGHT TO FOOD AND CLIMATE-READY PATENTS

The interrelationship, in terms of conflict or of coexistence, between intellectual property rights and human rights plays out in narratives of climate-ready seeds through discussions on agricultural biotechnology patents and the right to food. Although drug patents and the right to health captured most of earlier public attention, the sub-commission's report, mentioned previously, also articulated the right to food alongside the right to health.[120] This section will explore how the right to food is relevant and used in contradictory discussions about patent rights on climate-ready seeds. The different approaches and future scenarios of this contentious relationship will be used as a framework for this exploration.

In his report on seed policies and the right to food, the previous Special Rapporteur on the Right to Food explicitly addresses intellectual property rights. The report identifies three

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[117] Van Overwalle moreover makes a distinction between 'rights and values act as a basis to limit the coming into *existence* of patent rights in certain fields' and rights that 'serve as limitations with regard to the *exercise* of patent rights'. Ibid., 6.

[118] Laurence R. Helfer, 'Toward a Human Rights Framework for Intellectual Property' *UC Davis Law Review* 40 (2007).

[119] Ibid., 1015-1020.

[120] The report states that the implementation of the TRIPS Agreement poses an actual or potential conflict for 'the enjoyment of the right to food of plant variety rights and the patenting of genetically modified organisms', alongside the access to patented pharmaceuticals and the right to health. Sub-Commission on the Promotion and Protection of Human Rights, note 96 above.

serious issues with property rights on seeds in relation with the right to food, namely a halt in new innovations in agriculture by blocking access to seeds; research focus on commercially viable crops and neglect of other, perhaps more valuable, crops; and the lack of access for farmers to patented seeds.[121] De Schutter argues for an exemption from patent rights on seeds in cases where these patents hamper access to research necessary to address food insecurity.[122] One of the recommendations of the report is to have countries who have not yet ratified the TRIPS Agreement perform an assessment based on right to food standards prior to becoming party to this convention.[123] This is in line with Van Overwalle's suggestion of using human rights to prevent intellectual property rights from coming into existence.[124]

Another way in which the conflict between patent law and the right to food can be overcome, according to this report, is by relying on the general purposes of the TRIPS which state that a patent right 'may be restricted in the public interest'.[125] The report states that these tools to limit patent rights could work in the short term, for example 'to limit the negative impacts of the recent trend towards patent claims made following the adaptation of specific gene traits that could confer one or more forms of stress tolerance linked to climate change (including salinity, drought or flood, heat or cold)'.[126] In the case of drug patents, compulsory licensing was used to limit the patent rights in situations constituting a 'public health emergency'.[127] Although this has not yet materialized, it is conceivable that the impacts of climate change on crop yields could also be considered a 'public emergency'. If that were to be the case in the future, patent rights on climate-ready seeds could be limited to ensure that those who are in need have access to the seeds. Such an approach would not deny patent rights on seeds altogether, but rather prevent seed patents from undermining the right to food in certain circumstances.

As explained in Chapter 3 of this thesis, intellectual property rights must serve to reward the creator's labour and investments and benefit society with new innovations. A net benefit to society, or in case of plant patents the attainment of food security, is the 'ultimate rationale'.[128] As was the case for patents on new medicines, many contend that this balance is 'off' when it

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121 De Schutter 2009, note 53 above, 11-15.
122 Such an exemption would be in line with the research exemption or breeder's exemption in the UPOV. International patent law, as set down in the TRIPS Agreement, does not stipulate such a research exemption. See Chapter 3, section 1.1 on the UPOV and breeder's exemption.
123 De Schutter 2009, note 53 above, Conclusion and Recommendations, para 57(a).
124 Van Overwalle, note 111 above.
125 De Schutter 2009, note 53 above, 12.
126 Ibid., 12.
127 See at notes 104-108 above.
128 Philippe Cullet and Radhika Koluru, 'Plant Variety Protection and Farmers' Rights: Towards a Broader Understanding' *Dehli Law Review* 24 (2003), 1-2. See also: Chapter 3 at note 78.

comes to the application of patent rights on agricultural biotechnologies. Kerstin Mechlem and Terri Raney reiterate the objective of intellectual property rights and point at the skewed balance:

> Any system of intellectual property rights should serve a double function. It should protect the interests of both inventors and society at large. … While, in fact, patents, plant breeders' rights, and other types of intellectual property rights have greatly stimulated the growth of private agricultural research, the present balance between private and public interests may need to be reconciled.[129]

As the previous part of this chapter has shown, right to food approaches are often invoked as a means to counter corporate seed patents and regain this balance. The analysis will now turn to how narratives of climate-ready seeds portray the relationship between patent rights on climate-ready seeds and the right to food.

Section 2.1 of Chapter 3 of this thesis explained that seed corporations file many patent right applications for climate-ready seeds, and at the same time they present climate-ready seeds as way to combat climate-induced hunger. The implicit argument these seed corporations make is that patent rights are needed to combat climate-induced hunger.[130] Section 2.3 of the current chapter shows that seed corporations rely on, and benefit from, human rights law and discourse. There are recognitions that non-state actors and private corporations have a role to play in human rights commitments, and seed corporations themselves include these commitments to human rights in their policy statements. Moreover, references to 'feeding the world' and other such statements can be seen as an implicit commitment towards realizing the right to food.[131] On the basis of these previous discussions, the argument here is that seed corporations do not view intellectual property rights and human rights to be in contradiction; the suggestion is rather that the two can co-exist.[132] Although this argument is not made explicitly, the underlying inference seems to be that allowing patent rights on climate-ready seeds can contribute to realizing the right to food, by incentivizing research and development of those seeds. This can be linked back to Helfer's last future scenario, namely that intellectual property rights will serve to promote human rights.[133]

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[129] Kerstin Mechlem and Terri Raney, 'Agricultural Biotechnology and the Right to Food' in *Biotechnologies and International Human Rights, Studies in International Law*, ed. Francesco Francioni, 131-160 (Oxford: Hart Publishing, 2007), 152.
[130] See discussion in Chapter 3, section 2.1.
[131] See discussion in section 2.3 above.
[132] This is in line with the second approach sketched by Helfer 2003, note 114 above.
[133] Helfer 2007, note 119 above.

Civil society organizations and other critics denounce the growing patent rights on climate-ready seeds, and this resistance is directed mostly at the corporate domination of Gene Giants.[134] In addition to criticizing the monopoly of seed corporations, alternative rights are invoked in this narrative as a resistance, namely sovereign rights over natural resources and farmers' rights.[135] There is therefore opposition to patent rights on climate-ready seeds, although this opposition is concentrated specifically against corporations. Discussions in this current chapter reveal that critics (La Via Campesina, ETC Group, Navdanya, and others) invoke the right to food very explicitly in efforts to achieve food sovereignty and food security.[136]

On the basis of these discussions, the argument here is that this narrative, while recognizing the tensions between intellectual property rights and human rights, suggests that the right to food can be used to balance the negative effects of seed patents. This conclusion is based on the frequent use of right to food approaches, and the critical emphasis that is on corporate patents, rather than patents *per se*. The right to food as it is employed in the critical narrative adheres most closely to the approach sketched above of intellectual property rights and human rights being capable of coexisting, as long as a workable balance is found.[137] There is a fear that property law will expand further at the expense of human rights,[138] but there a hope that the right to food will serve as a tool to limit the scope of patent rights on climate-ready seeds.

Early recognition of the relationship between intellectual property rights and human rights started from the premise of 'apparent conflicts' between these legal regimes.[139] The first approach Helfer described recognizes this conflict and argues that human rights must be deemed superior to intellectual property rights. Analysing the discourse that feeds critical narratives of climate-ready seeds, however, suggests that there is room for coexistence of patent rights on seeds and the right to food. The role that the right to food plays in narratives of climate-ready seeds is one that primarily aims to inform and direct this adaptation strategy towards the ultimate goal of combating hunger.

[134] See discussion in Chapter 3, section 2.2.
[135] See Chapter 3, part 3.
[136] See discussion in section 2.2 above.
[137] See Helfer 2003, note 114 above.
[138] This is in line with the first future scenario articulated by Helfer 2007, note 119 above.
[139] Sub-Commission on the Promotion and Protection of Human Rights, note 96 above.

CONCLUSION

The examination of the relevance of human rights law in discussions about climate-ready seeds followed logically from the two previous chapters, which considered climate change adaptation law and intellectual property law, consecutively. Adaptation law contributes to creating an enabling environment for the use of agricultural biotechnologies, and the engagement of the private sector in developing adaptation strategies. Critical discussions about climate-ready seeds concentrate on the rapidly growing number of patent applications by private seed corporations on these seeds and technologies. Intellectual property law, in the form of patent rights, lies at the centre of these debates. As a means of resisting the perceived corporate monopoly of climate-ready seeds through strong patent rights, critics often invoke alternative forms of proprietary rights. The focus of these debates is on balancing the benefits for intellectual property rights-holders with the intended benefits of the protected innovations for society at large. Human rights are also used as a means of resistance against the corporate domination of climate-ready seeds.

This chapter started out by showing that the impacts of climate change have, in recent years, come to be seen as threats to, and potential violations of, human rights. Human rights are also raised as tools to direct strategies to deal with climate change impacts, under the banner of human rights-based approaches. The second part of this chapter explored the right to food in particular. Right to food approaches are regularly used in discussions about how to address the adverse impacts of climate change on agricultural crop yields. It was argued that although those resisting climate-ready seeds evoke the right to food most explicitly, narratives that promote climate-ready seeds also benefit from human rights law and discourse. The third and final part of this chapter examined the relationship between intellectual property rights and human rights. This relationship is often portrayed as negative, with the former impeding on the latter. However, a close examination of how the right to food is used in discussions on climate-ready seeds that criticize seed patents shows that the tone is more conciliatory. The prevalent approach seems to be one that endeavours to make the two areas of law work together to achieve an ultimate goal (in this case: combating climate-induced hunger).

Resistance movements employ the right to food as a tool to improve the functioning of climate-ready seeds, not primarily to dismiss them entirely. This conciliatory role of human rights in contentious narratives of climate-ready seeds can be seen as a reflection of the role of human rights in addressing tensions within the neoliberal food regime. The same line of logic is assumed: namely, that human rights law can contribute to 'correcting' the faults in the approach

to climate-ready seeds and in the neoliberal food regime more broadly. The next chapter will draw conclusions about the overall role of law in finding ways to combat hunger, and more broadly about the role of law in shaping the food regime.

5. TOWARDS A NEW FOOD REGIME TO END HUNGER? INTERNATIONAL LAW AND THE PYRAMID OF ASSUMPTIONS

INTRODUCTION

The four preceding chapters have laid out the main themes and questions of this research (Chapter 1), and explored the relevance of different areas of international law in narratives of climate-ready seeds (Chapters 2, 3, and 4). This chapter will bring together these explorations to provide an answer to the principal research question, namely: What role does law play in finding ways to combat hunger in the context of climate change?

Chapter 1 presented food regime theory as an analytical tool through which to study the strategic function of agriculture in the way the world is governed. This chapter will start by returning to food regime theory. Contradictory narratives of climate-ready seeds reflect the pressures on the current 'neoliberal' food regime. In response to these pressures, food regime theorists predict substantial changes to the neoliberal food regime or even the emergence of a new food regime. These anticipated changes in global food relations are relevant to discussions about climate-ready seeds. If neoliberal elements in global food relations change, then there is also a chance that climate-ready seeds will no longer be considered persuasive means to alleviate hunger.

The second part of this chapter will contain the main analysis, which is based on the overall role of law, or the cumulative effect of different relevant areas of law, in discourse on climate-ready seeds. It will start from the premise that there is a strong desire to resist neoliberal adaptation strategies, including corporately patented climate-ready seeds. The findings will bring to light that, although law is invoked in efforts to find better solutions to the problem of hunger, there is little attention for the influence of the legal system on maintaining a certain way of thinking about hunger. This argument will be made using a number of interconnected assumptions that underlie climate-ready seeds as tools to combat hunger, and that at the same time reveal key features of the neoliberal food regime. Most of the critiques of climate-ready seeds focus on the high number of patent applications on these seeds by a handful of corporations. Meanwhile, more fundamental questions about the causes of hunger and the best ways to deal with hunger are largely overlooked. The way in which international law is framed and invoked contributes to upholding these assumptions. My central argument is that law plays a role in sustaining a certain way of thinking about hunger in the context of climate change and thereby limits other ways of perceiving and fighting hunger.

The final part of this chapter will connect the analysis with the neoliberal food regime. If legal structures hinder effective challenges to climate-ready seeds, and resistance to climate-ready seeds reflects broader opposition to the neoliberal food regime, then what might this suggest about the future of the neoliberal food regime and the role that law may play in determining it?

1 CLIMATE-READY SEEDS AND THE NEOLIBERAL FOOD REGIME

Food regime theory was introduced in Chapter 1 and defined as an 'analytical device' to explore and analyse global food relations.[1] Bill Pritchard has referred to food regime theory as 'one of the most influential conceptual innovations in the field of agrifood studies over the past three decades'.[2] Although food regime theory has been influential in the field of social sciences – among sociologists, geographers, etc. – legal scholars have not studied or applied this way of understanding global food relations. Likewise, food regime theorists have not considered the relevance of international law.[3] Before proceeding to an analysis of the role of law in contradictory narratives of climate-ready seeds and the neoliberal food regime, the first part of this chapter will present some of the main predictions by food regime theorists about the future of the neoliberal food regime in the light of these tensions.

1.1 CRISIS FACING THE NEOLIBERAL FOOD REGIME

Food regime analysis focuses on periods of crisis, and is especially interested in changes in global food relations brought about by crises.[4] There is wide consensus among theorists that the current neoliberal food regime is facing such a period of crisis.[5] Critics of the neoliberal food regime often voice their opposition in terms of 'food sovereignty', which is used as a means

[1] Philip McMichael, 'A Food Regime Genealogy' *The Journal of Peasant Studies* 36 (2009), 148. See also: Chapter 1 at notes 39 and 40.
[2] Bill Pritchard, 'Food Regimes' in *The International Encyclopedia of Human Geography*, ed. Rob Kitchin and Nigel Thrift (London: Elsevier, 2009), 225. See also: Chapter 1 at note 36.
[3] Chapter 1, section 2.1 provides an introduction to, and an overview of, the main literature on food regimes. In studying this literature, it became evident to me that food regime analyses are done mostly by sociologists and geographers, like the 'inventors' of food regime theory, Harriet Friedmann and Philip McMichael (Harriet Friedmann and Philip McMichael, 'Agriculture and the State System: The Rise and Fall of National Agricultures, 1870 to the Present' *Sociologia Ruralis* 29 (1989), 93-117. See also: Chapter 1 at note 38). The main works on food regimes do not contain legal analyses, nor do legal scholars engage actively with food regime theory.
[4] Hugh Campbell, 'Breaking New Ground in Food Regime Theory: Corporate Environmentalism, Ecological Feedbacks and the 'Food from Somewhere' Regime?' *Agriculture and Human Values* 26 (2009), 309. See also: Chapter 1 at note 58. McMichael 2009, note 1 above, 142. Pritchard 2009, note 2 above.
[5] See, for example: Friedmann 2005, note 7 below; and Abergel, note 8 below.

through which to promote more local production over large-scale corporate production, and to claim more control for small-scale farmers and consumers in the global food system.[6] Harriet Friedmann argued that the privatization of the global food system will 'widen the gap between privileged and poor consumers as it deepens commodification and marginalizes existing peasants'.[7] Elisabeth Abergel likewise contended that the neoliberal food regime leads to 'the growing inequalities within the food system between North and South, which give rise to recurring food crises'.[8] In other words, the neoliberal food regime as it stands does not serve the world's poor and hungry, but rather serves those already rich (in food and in wealth) to grow richer. These criticisms exemplify key aspects of the crisis that faces the neoliberal food regime. Against this backdrop, what are some of the main predictions theorists make about the future of the neoliberal food regime? What kinds of changes to the neoliberal food regime do theorists expect?

Philip McMichael has promoted the concept of food sovereignty and argued that it can give rise to informing a new food regime beyond the neoliberal regime.[9] In presenting the flaws of the neoliberal food regime, he uses the idea of 'food from nowhere',[10] referring to the corporate monopoly of the global food system and the consequent loss of diversity in food production and consumption. McMichael then uses the term 'food from somewhere',[11] an articulation of the food sovereignty movement, to oppose 'food from nowhere'. Hugh Campbell builds on the notion of 'food from somewhere', and more explicitly examines its potential to change the direction of the current food regime.[12] Campbell proposes that 'food from somewhere' has the potential to transform the features of the third food regime. He advocates what he calls an 'ecological turn' in food regime theory.[13] 'Food from somewhere' has the

[6] See Chapter 1, section 2.3 on food sovereignty.
[7] Harriet Friedmann, 'From Colonialism to Green Capitalism: Social Movements and Emergence of Food Regimes' in *New Directions in the Sociology of Global Development*, ed. Frederick H. Buttel and Philip McMichael (Elsevier, 2005), 228. See also: Chapter 1 at note 97.
[8] Elisabeth A. Abergel, 'Climate-Ready Crops and Bio-Capitalism: Towards a New Food Regime?' *International Journal of Sociology of Agriculture and Food* 18 (2011), 262-262. See also: Chapter 1 at note 98.
[9] Philip McMichael, 'La Restructuration Globale Des Systèmes Agro-Alimentaires' *Mondes en Développement* 30 (2002), 90-91. See also: Chapter 1, note105 .
[10] José Bové and François Dufour, when speaking about the uniformity of McDonald's hamburgers, call them 'food from nowhere' and say that 'McDonald's represents anonymous globalization, with little relevance to real food'. José Bové and François Dufour, *The World Is Not for Sale: Farmers against Junk Food* (London: Verso, 2001), 55.
[11] McMichael 2002, note 9 above, the last sentence of this article, on page 52: '… il déclenche des contre-mouvements soucieux de réinstaurer des "souverainetés alimentaires", c'est-à-dire des "nourritures de quelque part"'.
[12] Campbell, note 4 above.
[13] Ibid., 316-318.

potential to have a hand in such an ecological turn, by recognizing and incorporating environmental concerns into the food regime.[14]

Friedmann's criticism of the neoliberal food regime focuses on the expanding private sector control, resulting in growing disparity between rich producers and poor consumers.[15] To predict the future of the neoliberal food regime, Friedmann uses Tim Lang's and Michael Heasman's 'conflicting paradigms'.[16] These paradigms are the 'Life Sciences Integrated paradigm' – linked to genetic engineering, biotechnology, specialized sciences, improving productivity, etc. – and the 'Ecologically Integrated paradigm' – linked to more emphasis on local production, social movements including Slow Food, agroecology, etc.[17] The conclusion Friedmann draws is that the former paradigm, which most closely relates to the characteristics of the neoliberal food regime, is not yet the indisputable winner. She writes that '[i]ntegrated networks may offer a democratic and sustainable alternative' to another regime based on capital accumulation.[18] Friedmann, like McMichael and Campbell, sees a possible future for a more ecologically-informed food regime.

Gabriela Pechlaner and Gerardo Otero make similar predictions through their study of the negative social impacts of agricultural biotechnology on developing countries, and the subsequent exacerbation of inequalities between developed and developing countries.[19] They argue that '[r]esistance efforts directed specifically at biotechnology … or at the conjunction of biotechnology and the neoliberal paradigm … will affect [the neoliberal food regime's] future shape'.[20] They too contend that resistance movements – such as those embodied in food sovereignty – can change the neoliberal food regime. They also anticipate that the future food regime should move towards less emphasis on corporate control and more emphasis on local control.

In a recent article, Eric Holt-Giménez and Annie Shattuck set out a number of trends they observe within global food movements, including calls for substantial changes to the existing food regime or the emergence of a new food regime.[21] They conclude that the neoliberal

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[14] Ibid., 317.
[15] Friedmann 2005, note 7 above.
[16] Ibid., 258-259.
[17] Tim Lang and Michael A. Heasman, *Food Wars: The Global Battle for Mouths, Minds and Markets* (London: Earthscan, 2004). See also: Chapter 1 at note 92.
[18] Friedmann 2005, note 7 above, 259.
[19] Gabriela Pechlaner and Gerardo Otero, 'The Third Food Regime: Neoliberal Globalism and Agricultural Biotechnology in North America' *Sociologica Ruralis* 48 (2008), 351. See also: Chapter 1 at note 83.
[20] Ibid., 366.
[21] Eric Holt-Giménez and Annie Shattuck, 'Food Crises, Food Regimes and Food Movements: Rumblings of Reform or Tides of Transformation?' *The Journal of Peasant Studies* 38 (2011), 136. See also: Chapter 1 at note 110.

food regime will be either altered from within or replaced entirely by a new food regime.[22] Notwithstanding nuances in predictions about the future of the neoliberal food regime, all agree that this period of crisis will change the current regime. Theorists generally agree that the future food regime should be based less on corporate monopoly and more on local control and more sustainable food production and consumption. The next section will look at the influence of climate change on projections of the food regime future.

1.2 CLIMATE CHANGE AND FOOD REGIME CHANGE

The (predicted) impacts of climate change on agriculture add to the crisis facing the neoliberal food regime. The problematic relationship between climate change and food production intensifies the need to consider whether the current food regime is capable of dealing with these adverse effects. Some critics consider that the flaws of biotechnological, private corporation-dominated solutions to hunger in the face of climate have also highlighted the shortcomings of the neoliberal food regime. Comments relating climate change to the food regime crisis echo criticisms of the neoliberal food regime and emphasize this regime's inadequacy in dealing effectively with climate-induced hunger. La Via Campesina, the organization that initiated the food sovereignty movement, has written that:

> The neo-liberal solutions to climate change … make it increasingly difficult for small-scale farmers and peasants to make a living from agriculture … All over the world, seed giants widen their intellectual property rights agenda to forbid peasants to reproduce their own seeds, the only varieties that can effectively adapt to changing climatic conditions. The seed giants impose patented hybrid and GM seeds.[23]

Colin Sage has identified climate change as one 'dimension of vulnerability' facing the current global food system. He states that:

> [T]he food regimes approach has a useful role to play in demonstrating that the pursuit of neoliberalism in food and agriculture worldwide over the past thirty years … has left a

[22] Ibid.

[23] La Via Campesina, 'UNFCCC: Don't Trade Off Climate!' 6 December 2008, http://viacampesina.org/en/index.php/actions-and-events-mainmenu-26/-climate-change-and-agrofuels-mainmenu-75/626-unfccc-dont-trade-off-climate, last accessed on 22 July 2015.

> terrible legacy of environmental damage, resource depletion, one billion undernourished and more than one billion over-nourished and overweight.[24]

Sage furthermore asserts that food systems that focus more on local food security and sustainable production can offer 'a genuine alternative to a neo-liberal agricultural model failing to feed the global population in a warming world'.[25] In conclusion to his argument, he suggests that:

> [W]e need further research that is less preoccupied with the development of new technologies to feed nine billion people in 2050, but more concerned with revealing the interconnections between a hegemonic agri-food system, the degradation of environmental support systems and stressed human metabolic states. Only then will we be able to devise effective global governance capable of resolving the problems of food insecurity and malconsumption in a warming world. [26]

Abergel, in a similar vein, advocates the need for changes to the neoliberal food regime by explicitly scrutinizing climate-ready seeds as an adaptation strategy. She suggests that the contradictory reports on the value and effectiveness of climate-ready seeds undermine the foundation of the neoliberal food regime. Her argument is that the conflicting accounts of climate-ready seeds – especially the limits of technology in resolving the problems of climate change and hunger – reflect the shortcomings of the neoliberal food regime. These shortcomings will, according to Abergel, foster the emergence of a 'new' food regime in the form of a so-called 'neo-productivist' regime that 'places greater value on locally adapted sustainable food production methods'.[27]

The central theme is that the increasing privatization and corporatization of global food systems has not alleviated hunger, and has arguably even exacerbated hunger. The effects of climate change and neoliberal adaptation strategies further aggravate this problem, and strengthen calls for changes to the current food regime. Holt-Giménez and Shattuck express the need for a radical change in the neoliberal food regime by writing that:

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[24] Colin Sage, 'The Interconnected Challenges for Food Security from a Food Regimes Perspective: Energy, Climate and Malconsumption' *Journal of Rural Studies* 29 (2013), 78.
[25] Ibid., 76.
[26] Ibid., 78.
[27] Abergel, note 8 above, 272.

> To put an end to hunger, the practices, rules and institutions determining the world's food systems must change. This implies regime change.[28]

Law is part of the 'practices, rules and institutions determining the world's food systems'. However, the projections about the future of the neoliberal food regime do not consider the resistance of international law to the emergence of a new food regime. The next part of this chapter will provide the main analysis of the research. It will rely on discussions in the foregoing chapters to examine the role of law as employed in contradictory accounts on climate-ready seeds. The conclusions will be connected with a consideration of the role of law in the anticipated changes to the neoliberal food regime.

2 THE ROLE OF LAW IN NARRATIVES OF CLIMATE-READY SEEDS: FIVE ASSUMPTIONS UPHELD

Many participants in discussions related to global food systems consider the neoliberal traits of the current food regime to be an inadequate framework through which to tackle hunger.[29] The predicted adverse impacts of climate change on food production and hunger and the perceived failings of climate-ready seeds as an adaptation strategy have added fuel to this sentiment. Against the backdrop of predictions about an impending shift towards a new food regime, this section will investigate the role that law plays, especially in narratives of climate-ready seeds, in attempts to bring about better solutions to hunger. Climate-ready seeds exemplify the neoliberal food regime, and critics of climate-ready seeds, by highlighting issues related to privatization and commodification of food, also indirectly criticize the existing food regime. If climate-ready seeds will not contribute to combating hunger, then what alternative solutions do critics suggest in the fight against hunger? And more specifically, what role does international law play in conceiving ways to more effectively tackle hunger?

The analysis in this thesis is centred on a framework of fundamental assumptions underlying all narratives of climate-ready seeds. This framework also exposes some of the main features of the neoliberal food regime. These assumptions are as follows: 1) climate change causes hunger; 2) increased food production is necessary to eradicate hunger; 3) agricultural

[28] Holt-Giménez and Shattuck, note 21 above, 132.
[29] This is evident in the rise of food sovereignty movements that resist the idea that food security can be achieved through free trade and free markets. See Chapter 1, section 2.3 on food sovereignty.

biotechnologies are necessary to increase food production; 4) private sector investments in agricultural biotechnologies are necessary to eradicate hunger; and finally, 5) intellectual property rights on seeds are necessary to incentivize investments in agricultural biotechnologies that will eradicate hunger. Each of these assumptions is contested, and critical narratives of climate-ready seeds employ international law to challenge these assumption. What this analysis will reveal, however, is that international law – the manner in which it is framed, interpreted, and invoked – tends to reinforce the underlying assumptions. The ultimate argument is that there can be no real changes to the neoliberal food regime until these underlying assumptions, and the role that law plays in maintaining them, are examined and challenged.

The assumptions can be viewed as a pyramid. The first assumption forms the base of the pyramid, and each subsequent assumption is positioned one step higher in the pyramid. For each next assumption to be discussed, the previous assumption has to be accepted. Discussing the need to develop new climate-resilient biotechnologies to increase food production in the fight against hunger, for example, implicitly accepts the need to produce more food. Most of the critiques are directed against the large number of patent applications on climate-resilient seeds by Gene Giants, resulting in a monopoly position for a handful of corporations. This issue is situated at the very top of the pyramid. Granting so much attention to this question subtly reinforces the assumptions that are positioned lower in the pyramid. The argument is not that these five assumptions are in themselves not contested. On the contrary, each is subject to doubts and controversies. The argument is that the way in which international law is framed discourages critics from questioning these assumptions through legal discourse. The significance of the pyramid structure is that, despite serious contentions about each distinct assumption, with the acceptance of each subsequent assumption the previous ones become more ingrained and more difficult to challenge.

These assumptions will be examined consecutively, drawing on discussions in foregoing chapters to show how international law contributes to maintaining the assumptions.

2.1 ASSUMPTION 1: CLIMATE CHANGE CAUSES HUNGER

How hunger is perceived influences the strategies devised to address it.[30] Those who assert that climate-ready seeds can be helpful in combating hunger in the face of climate change must

[30] See, for instance: James Vernon, *Hunger: A Modern History* (Cambridge, MA: The Belknap Press of Harvard University Press, 2007), 1-2. See also: Chapter 1 at notes 13 and 14. Sarah Millman and Robert W. Kates, 'Toward

logically accept that there is a causal link between climate and hunger. The recognition of the connection between climate and hunger is not new.[31] Climatic conditions influence agriculture and food production, and are therefore often linked to hunger. Just like the recognition of this connection is not unfamiliar, debates about the nature of this relationship have also been ongoing. The discussion in Chapter 1 indicated that climatic variables are often viewed as 'proximate' causes of hunger; and that hunger is not caused directly by climatic variables, but rather by the *inability to adapt* to a changing climate.[32] These age-old debates continue in the context of current climate change. The main argument that will be made in setting out this first assumption is that discourse on climate-ready seeds – including legal discourse – reinforces the perception that climate change itself causes hunger. That is not to say that socio-economic vulnerability and political factors are disregarded, but merely that the way in which the link between climate change and hunger is presented serves to foreground the influence of climate over other factors.

Before delving into the narratives of climate-ready seeds, this paragraph will first present a historical analysis of the link between climate and hunger through a study by Mike Davis on causes of colonial famines. Davis studied famines that occurred on the Indian subcontinent under British colonial rule from the mid-18th to the mid-20th century.[33] His exploration highlights different presentations of the causes of these famines. Davis draws on the distinction made by the Chinese between 'bad weather' and 'bad system'.[34] 'Bad weather' regards the climatic conditions in themselves as a cause of famine, whereas 'bad system' constitutes political, social, and economic systems which leave some people more vulnerable to 'bad weather', and fail to take measures to decrease their vulnerability, thereby causing famine.

With the obvious benefit of hindsight, Davis shows that 'pre-British India' did not suffer from similar famines, despite similar weather conditions.[35] British colonial rulers nevertheless regularly attributed famines that occurred in their colonies to unfavourable climatic conditions.[36]

Understanding Hunger' in *Hunger in History: Food Shortage, Poverty and Deprivation*, ed. Lucile F. Newman and William Crossgrove (Oxford: Basil Blackwell, 1989), 3. See also: Chapter 1 at note 14.

[31] See, for example: Reid A. Bryson and Thomas J. Murray, *Climates of Hunger: Mankind and the World's Changing Weather* (Madison, 1977), 3. See also: Chapter 1 at notes 124 and 125.

[32] See: Liz Young, *World Hunger*, Routledge Introductions to Development (London; New York: Routledge, 1996), 115. See also: Chapter 1 at note 147.

[33] Mike Davis, *Late Victorian Holocausts : El Niño Famines and the Making of the Third World* (New York: Verso, 2001).

[34] Ibid., 280.

[35] Ibid., 285: '… there is little evidence that rural India had ever experienced subsistence crises on the scale of the Bengal catastrophe in 1770 under East India Company rule or the long siege by disease and hunger between 1875 and 1920 that slowed population growth almost to a standstill.' Also: 'There is considerable evidence … that in pre-British India before the creation of a railroad-girded national market in grain, village-level food reserves were larger, patrimonial welfare more widespread, and grain prices in surplus areas better insulated against speculation.'

[36] Ibid., 291.

Davis explains the 'official line of the British in Victorian India as recapitulated in every famine commission report and viceregal allocution: *millions were killed by extreme weather, not imperialism*'.[37] For colonial powers, it was evidently more convenient to argue that 'bad weather' caused famines than to admit that 'bad systems' also contributed to the widespread scarcity of food in certain regions. Unlike bad systems, bad weather was beyond their control. The main point here from Davis's study is that climate does affect hunger, but it is not the only factor. He writes that: 'Certainly the intensity of the ENSO cycle in the late nineteenth century … must loom large in any explanation of the catastrophes of the 1870s and 1890s. But it is scarcely the only independent variable.'[38]

Davis studied hunger in a time long before the contemporary debates about climate change. Yet, the distinction between climate and vulnerability to climate as a cause of hunger is still very relevant today. Contemporary discourse on climate change also recognizes that climate change alone does not cause hunger. This is evident, for instance, in the special attention given to those regions and peoples most vulnerable to the impacts of climate change. General vulnerability and the inability to adapt are the main risk factors in terms of food insecurity and hunger, and climate change exacerbates these risks.[39] Vulnerability can be attributed to what Davis referred to as 'bad system', or a system that fails to alleviate vulnerability, for instance by not tackling poverty and failing to provide people with the economic means to access adequate food. Despite this recognition, however, climate change discourse gives prominence to climate itself as the cause of hunger, in other words, 'bad weather'. This can be compared to how the British explained colonial famines, even though there already existed similar recognition at the time that imperial rule was partially responsible for making people vulnerable. Even international law tends to underscore this position. The following section will engage with this argument.

Concerns about the impact of climate change on hunger are rife and popular discourse advances the depiction of climate change (in the sense of 'bad weather') as the primary cause of hunger. Experts argue that climate change will 'intensify the risk of hunger' and that instances of hunger will increase by 10-20 per cent by the year 2050 as a result of climate change.[40] Media

[37] Ibid., 280. Emphasis added.
[38] Ibid., 287-288.
[39] See, for instance: 'Climate Change 2014: Synthesis Report.' Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, ed. R.K. Pachauri and L.A. Meyer (Geneva, Switzerland: IPCC 2014), especially on page 55 on 'exposure and vulnerabilities'. See also: Chapter 1 at note 132.
[40] Martin Parry et al., 'Climate Change and Hunger: Responding to the Challenge' (World Food Programme, 2009), 14. See also: Chapter 1 at note 141.

headlines based on such reports state things like: 'Climate Change Will Worsen Hunger',[41] 'Climate Change Could Become a Leading Cause of Hunger',[42] and 'Poor Face More Hunger as Climate Change Leads to Crop Failure',[43] only to mention a few. Even though there are also clear acknowledgements that the impacts of climate change must be seen in a larger context, including especially questions of poverty and vulnerability,[44] the discussion that follows will argue that discourse foregrounds climate change itself as the leading cause of hunger.

Current climate change is new in that it is highly likely to be at least in part anthropogenic, and moreover is occurring much more rapidly than earlier climatic changes.[45] The label 'anthropogenic' suggests something interesting in the perception of climate change and hunger. Anthropogenic is associated with climate change itself. In other words, the unusually rapid climatic changes are caused by human activities. It does not refer to 'manmade' causes of hunger. There is no mention of anthropogenic hunger. The use of the term anthropogenic recognizes that human activities have exacerbated the rate and magnitude of current climate change, but it does not recognize, at least not explicitly, that these same human activities have left some people much more vulnerable to its consequences. Climate change is (in part) anthropogenic, and climate change exacerbates hunger, but hunger is not anthropogenic. This representation of the link between climate change and hunger can be compared to Davis's study. Like the British colonizers, contemporary climate change discourse puts forth 'bad weather' as the leading cause of hunger.

Different fields of international law that are pertinent to the issue of climate change and hunger explicitly or implicitly reinforce this dominant perception. Climate change adaptation law was drafted as a response to the presumed imperative that something must be done to deal with the inevitable and irreversible adverse effects of climate change.[46] This area of law also reinforces

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[41] Ben Block, 'Climate Change Will Worsen Hunger, Study Says' World Watch Institute, http://www.worldwatch.org/node/6271, last accessed on 22 July 2015. This article is based on a report by the International Food Policy Research Institute (IFPRI).

[42] Action Against Hunger, 'Climate Change Could Become a Leading Cause of Hunger', http://www.actionagainsthunger.org/blog/climate-change-could-become-leading-cause-hunger, last accessed on 22 July 2015.

[43] John Vidal, 'Poor Face More Hunger as Climate Change Leads to Crop Failure, Says Oxfam' *The Guardian*, 5 July 2009, http://www.theguardian.com/environment/2009/jul/05/crops-farmers-climate-change-oxfam, last accessed on 22 July 2015.

[44] See, for instance: Gerald C. Nelson et al., 'Food Security, Farming, and Climate Change to 2050: Scenarios, Results, Policy Options' (Washington D.C.: International Food Policy Research Institute, 2010), Introduction, 1. See also: Chapter 1 at notes 144-146.

[45] See the Introduction to this thesis and Chapter 2, part 1.

[46] See Chapter 2, section 1.1.2, especially: Intergovernmental Panel on Climate Change, *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. M.L. Parry et al. (Cambridge, UK: Cambridge University Press, 2007). See also: Chapter 2 at note 1.

the urgency presented by climate change.[47] Adaptation obtained leverage in large part due to the recognition that not all effects of climate change are reversible, and therefore mitigation alone does not suffice.[48] The texts of the UNFCCC and the Kyoto Protocol, as well as reports written under the auspices of the IPCC and the UNFCCC, are generally conducive to the use of agricultural biotechnologies to increase food production as an adaptation strategy.[49] Moreover, international climate change understood law – understood in a broad fashion – sets a favourable precedent for inviting private sector engagement in adaptation strategies.[50] This focus on agricultural biotechnologies and private sector engagement implicitly underscores the belief that climate change itself is the principal cause of hunger. The emphasis lies not on reducing vulnerability by addressing 'bad systems', but rather on reducing crop yield losses in the face of 'bad weather'. The way in which climate change adaptation law is framed favours the recognition that genetically engineered seeds are solutions to climate-induced hunger.

The idea that climate change causes hunger also provides a basis for seed corporations to promote the need to invest in research and development of climate-resilient agriculture.[51] Critical voices that do not believe that climate-ready seeds will be conducive to combating hunger focus their criticism on seed corporations and on strong corporate patent rights which grant these corporations an effective monopoly of the seed market.[52] They rely on alternative forms of proprietary rights – including sovereign rights over natural resources and farmers' rights – to resist the corporate monopoly.[53] The most urgent issue appears to be that private sector corporations are dominating adaptation strategies and tools. Rejecting the corporate monopoly by invoking other forms of rights could implicitly suggest an acceptance of the causal correlation between climate change and hunger. This argument consists in nuances. International law impels participants in the debate to rely on forms of proprietary rights to claim ownership over seeds. However, within the legal framework, there is little room to question the nature of the relationship between climate change and hunger.

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[47] This is evident, for instance, in the shift in emphasis from 'preventionist' and adaptationist' approaches to adaptation (Robert W. Kates, 'Climate Change 1995 – Impacts, Adaptations, and Mitigation' *Environment* 39 (2002), 31-32, Chapter 2 at notes 16-17), to a 'realist' approach to adaptation (Richard J.T. Klein and Donald C. MacIver, 'Adaptation to Climate Variability and Change: Methodological Issues' *Mitigation and Adaptation Strategies for Global Change* 4 (1999), 190, Chapter 2 at notes 22-23).

[48] See the 'realist' approach, articulated by Klein and McIver, note 47 above.

[49] See Chapter 2, section 2.2.

[50] See Chapter 2, section 3.2.

[51] See Chapter 1, section 3.2.1.

[52] This is evident, for instance, in a 2010 ETC Group report: ETC Group,'Capturing "Climate Genes": Gene Giants Stockpile Patents on "Climate-Ready" Crops in Bid to Become "Biomassters"' (ETC Group, 2010), 2. See also: Chapter 3 at note 70.

[53] See the discussion on sovereign rights over natural resources and farmers' rights in Chapter 3, section 2.3.

Human rights law also underlines the causal link between climate change and hunger. In recent years, climate change has come to be perceived as a threat to human rights. The predicted negative impact of climate change on crop yields has generated special consideration for the right to food.[54] Participants in the debate on climate-ready seeds regularly employ rights-based approaches in attempts to incorporate right to food standards.[55] How human rights – including the right to food – are framed and invoked, however, makes it difficult to use this field of law to challenge underlying assumptions. In the process of clarifying and instrumentalizing human rights, there is little time to explore the relationship between climate and hunger. Within the existing framework of human rights, participants in the debate on climate-ready seeds put considerable efforts into incorporating right to food standards.[56] The result is, however, limited to directing or correcting adaptation strategies, aimed at addressing food insecurity, which are based on the same underlying assumptions.

The relationship between climate and hunger is very complex. This complexity is recognized in climate change discourse. Colin Sage describes the challenges in terms of climate change and food security as follows:

> Food security needs to be understood, not as an inevitable and immutable outcome of biophysical changes in climate, but as a reflection of social, economic, institutional and technological responses (and non-responses). It is, above all, about grappling with an entire nexus of inter-related issues concerning hunger, poverty, social and economic inequalities, health and nutrition, climate change and resource depletion.[57]

This citation is provided here to indicate that there exists, without a doubt, an understanding and awareness that climate change and hunger is not a simple causal connection, but rather a 'nexus of inter-related issues'. This is again in line with Davis's argument with regard to Victorian famines.[58] Davis, with his depiction of 'bad weather' versus 'bad system', did not intend to argue that either one or the other is the only cause of hunger, but a combination of numerous factors causes hunger. However, British colonizers did emphasize the significance of 'bad weather' over 'bad system' in order to downplay their own responsibility in causing famines in their colonies,

[54] See Chapter 4, section 1.1.
[55] See Chapter 4, part 2.
[56] This can be seen especially in the discussion about seed patents and the right to food, Chapter 3, section 3.2. The outcome of this discussion was that the right to food is used predominantly as a means to direct or to balance the effects of patent rights on seeds. Part 2 of Chapter 3 moreover illustrates that all narratives of climate-ready seeds invoke human rights to some extent, more or less explicitly.
[57] Sage, note 24 above, 76.
[58] Davis, notes 33-38 above.

and highlight the power of nature instead.[59] In the same vein, discussions on climate-ready seeds foreground the weight of climate change as the most important cause of hunger. The way in which international law is framed leaves little room for participants in the discussion to invoke law in such a way as to question this premise. Employing this legal discourse, however, helps to uphold the assumption.

Leaving the assumption that climate change causes hunger by and large unchallenged dictates a certain way of understanding hunger, and consequently limits the approaches of fighting hunger. The danger of accepting this premise too easily lies in narrowing the perception of hunger, and thereby limiting the avenues of solutions to hunger. International law, in the way it is framed and employed by actors, contributes to establishing a certain framework of thinking about climate change and hunger. If climate change causes hunger, what can and must be done to alleviate it?

2.2 ASSUMPTION 2: INCREASED FOOD PRODUCTION IS NECESSARY TO ERADICATE HUNGER

As with the nature of the relationship between climate and hunger, the question of what must be done to eliminate hunger has been greatly debated. Chapter 1 set out different perceptions of hunger that give priority to either food production or food access as means of combating hunger.[60] These two dominant perceptions were articulated through the ideas of Thomas Malthus and Amartya Sen. Malthusian conceptions of hunger, as used in this research, underscore the importance of adequate food availability and production to feed the world population.[61] Sen's theory of entitlement and command emphasizes not lack of food, but rather lack of access (both physical and economic) to food.[62] Although this is a clear oversimplification of much more complex and diverse arguments in efforts to eradicate hunger, the solutions to hunger will be distinguished here as: 1) solutions primarily based on increasing production, and 2) solutions primarily based on improving access. The following discussion will argue that the international legal framework, as a whole, tends to underline hunger in the face of climate change principally as a problem of production.

Concerns about the negative effects of climate change on agriculture focus heavily on projected crop yield losses as a result of droughts, higher average temperatures, and other

[59] Ibid, note 37 above: 'millions were killed by extreme weather, not imperialism'.
[60] See Chapter 1, section 1.1 on definitions of hunger and food security.
[61] See, for more discussion on Malthusian conceptions of hunger, Chapter 1, section 1.2.
[62] See, for more discussion on Sen's conception of hunger, Chapter 1, section 1.2.

climatic conditions.[63] This looming backdrop of rapidly declining crop yields provides a conducive setting in which to place strong emphasis on the idea that food production must increase to eradicate hunger. In the late 18th century, Malthus already predicted that population growth in addition to limited resources would lead to famines and starvation. There is disagreement with Malthus's theory, with one line of contention being the failure to consider industrial and technological advancements in agricultural production.[64] The world population has now reached over seven billion people – far more than at the time Malthus made his claims – and there is still enough food available on a global scale.[65] Notwithstanding assertions that there is more than enough food being produced to feed the world, fears of limited resources are still widespread[66] and propagated by the projected effects of climate change on agriculture.[67]

International law which attempts to regulate and direct adaptation strategies, such as climate-ready seeds, is inclined to foreground hunger as a problem of availability – as a problem of production – and to leave questions of access and distribution in the background. As discussed in Chapter 2, international climate change adaptation law is favourable to the development and use of agricultural biotechnologies with the aim to increase food production,[68] and moreover creates an enabling environment for private sector engagement in adaptation strategies.[69] The texts of the UNFCCC and the Kyoto Protocol do not directly state that food production is necessary to adapt to climate change and fight hunger. However, by encouraging the use of agricultural biotechnologies and private sector involvement, climate change adaptation law implicitly foregrounds production as a solution. In narratives of climate-ready seeds, there is

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[63] The latest IPCC assessment report highlights the dire impact of climate change on food production and food security. John R. et al., 'Food Security and Food Production Systems' in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, UK and New York, NY, USA: Cambridge University Press, 2013), See also: Chapter 1 at notes 135-139.

[64] See, for example: Chris Williams, 'Are There Too Many People? Population, Hunger, and Environmental Degradation' *International Socialist Review* 68 (2010), http://isreview.org/issue/68/are-there-too-many-people, last accessed on 22 July 2015. See also: Chapter 1 at note 23 . See also: Indur M. Goklany, 'Why the Neo-Malthusian Worldview Fails the Reality Check', 30 April 2010, Cato Institute, http://www.cato.org/blog/why-neo-malthusian-worldview-fails-reality-check, last accessed on 22 July 2015.

[65] Robert J. Mayhew, 'Malthus and the Seven Billion' *History Today* 62 (2012).

[66] The 1972 publication of *The Limits to Growth*, in which the authors explore the interaction between exponential economic and population growth and finite natural resources, has stimulated a great deal of debate. Donella H. Meadowset et al. *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*. New York: Universe Books, 1972. A later publication from 1987, *Our Common Future*, also known as the Brundtland report, has also been influential in furthering discussions about resource management and particularly 'sustainable development'. World Commission on Environment and Development, *Our Common Future*, Oxford, UK; New York, US: Oxford University Press, 1987.

[67] For instance, the World Resources Institute in its 2013-2014 report names 'The Climate Change Challenge' in its introduction (on page 2). World Resources Institute, 'Creating a Sustainable Food Future: The 2013-14 World Resources Report, Interim Findings, Washington, DC: World Resources Institute: 2014, http://www.wri.org/sites/default/files/wri13_report_4c_wrr_online.pdf, last accessed on 22 July 2015.

[68] See discussions in Chapter 2, especially part 2.

[69] See discussions in Chapter 2, part 3.

no discussion about the role of adaptation law in creating a favourable setting for the production solution to prevail almost exclusively.[70] There is much more debate about intellectual property law.

Chapter 3 illustrated the controversy that exists concerning the rising corporate patent applications on climate-ready seeds. The application of patent rights for seeds genetically engineered for resilience in the face of climate change also suggests that increased food production is important.[71] Opponents of the corporate seed monopoly through patent rights regularly draw on concepts of sovereign rights and farmers' rights.[72] Proponents of sovereign rights and farmers' rights do seek to stress the importance of access to food. However, at the heart of this struggle lies the question of who should hold proprietary rights over seeds. The central question is not whether increasing food production is the solution to hunger, and more precise questions of where and how production must increase are also not posed. The debate about intellectual property rights on climate-ready seeds tends to focus on what strategies and policies should be adopted to ensure adequate food production. Intellectual property law sets the context for discussing ownership of rights over seeds and crops that are produced; it does not leave much space for debating the different aspects of food security and hunger.

Apprehensions about reducing hunger to a problem of production are iterated in discussions about climate change. To give an example, the chief executive officer of the Consultative Group for International Agricultural Research (CGIAR) has stated that:

> Food production will have to rise 60% by 2050 just to keep pace with expected global population increase and changing demand. Climate change comes on top of that. The annual production gains we have come to expect … will be taken away by climate change. *We are not so worried about the total amount of food produced so much as the vulnerability of the one billion people who are without food already and who will be hit hardest by climate change.* They have no capacity to adapt.[73]

The Food and Agriculture Organization makes similar claims, suggesting that global food production must increase by 70 per cent, but that, at the same time, increasing production is not

[70] Different narratives of climate-ready seeds are presented in Chapter 1, part 3.2 of this thesis. There is no mention in these stories of the role that international law that regulates climate change adaptation plays in enabling or obstructing climate-ready seeds as a potential adaptation strategy.
[71] Patent rights are commonly justified as incentives for investing in and developing new crops; these new crop are primarily intended to increase yields, in other words, to increase the production of food. See discussion in Chapter 3, part 2.
[72] See Chapter 3, part 3, for a discussion of the concepts sovereign rights over natural resources and farmers' rights.
[73] Vidal, note 43 above. Emphasis added.

enough to achieve an end to hunger.[74] Serious attention must be paid to the specific regions in which food production must increase, the types of food crops that must be produced, and to ensuring availability and access to food for those regions and peoples who are most likely to suffer from food shortages. Although there may be good arguments for global food production having to increase to eliminate hunger, the discussion should not neglect crucial questions about the interrelation between food production and food access.

While early definitions of food security focused heavily on availability of food,[75] more recent articulations have also included access to and distribution of food.[76] Right to food experts have put great efforts into finding ways to put this right to use in order to achieve equitable distribution and adequate access to available food. The previous Special Rapporteur on the Right to Food, Olivier De Schutter, has been especially active in this regard. He has stated that a right to food approach to seed policies should focus attention not only on how to maximize agricultural yields, but also on who benefits from these increased yields.[77] Efforts to utilize the right to food to achieve better access to food are, however, hindered by tendencies in international law that still emphasize the production solution very strongly.

The latest IPCC assessment report from 2013 recognizes, in chapter 7 on 'Food Security and Food Production Systems', that '[m]ore than enough food is currently produced per capita to feed the global population',[78] and that many complex socio-economic factors other than production are important in attaining food security.[79] Notwithstanding these acknowledgements, the chapter still states that 60 per cent more food production is needed by 2050.[80] Discussion in this chapter of the IPCC report emphasizes the predicted impacts of climate change on crop yields, and focuses almost entirely on increasing production as an adaptation strategy.[81] The

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[74] Food and Agriculture Organization, 'High Expert Level Forum Issue Brief: How to Feed the World in 2050' (Rome: FAO, 2009), http://www.fao.org/news/story/en/item/35571/icode/, last accessed on 22 July 2015.

[75] The 1974 World Food Conference in its definition of food security emphasized the availability of adequate food. United Nations, 'Report of the World Food Conference, Rome 5-16 November 1974' (New York, 1975). See also: Chapter 1 at note 2.

[76] The 1996 World Food Summit included 'physical and economic access to food' in the definition of food security. Food and Agriculture Organization of the United Nations, 'Rome Declaration on World Food Security and World Food Summit Plan of Action, World Food Summit 13-17 November 1996' (Rome, 1996), http://www.fao.org/docrep/003/w3613e/w3613e00.HTM, last accessed on 22 July 2015. See also: Chapter 1 at note 3.

[77] Olivier de Schutter, 'The Right to Food: Seed Policies and the Right to Food: Enhancing Agrobiodiversity and Encouraging Innovation' (United Nations General Assembly, 2009), 2. See also: Chapter 4 at notes 53-54.

[78] Porter et al., note 63 above, 490.

[79] Ibid.

[80] Ibid.

[81] Ibid. The authors note, in paragraph 7.1.1, that '[T]his chapter synthesises and evaluates evidence for the impacts of climate on both production and non-production elements and their adaptation to climate change'. However, they also state that '… often researchers consider only the impact on the production element of food security.' This can

predominant story remains, implicitly, that climate change negatively affects crop yields and consequently exacerbates hunger, and that adaptation strategies aim primarily at increasing production. There is very little discussion about distribution of food and access to food for those most vulnerable to hunger and the exacerbating effects of climate change.

Challenging the strong focus on increasing global food production and the lack of attention for questions of access and distribution can be a difficult position to take against the backdrop of dried-out fields and crops that fail to grow. Moreover, accepting the assumption that climate change causes hunger by leading to a decline in crop yields makes it difficult to deny that increasing production must at least be part of the solution. The main question in narratives of climate-ready seeds is not: How does increasing food production relate to distribution of food and access to food as a means to combat hunger in the context of climate change?; but rather: How do we equitably distribute the extra food that needs to be produced? This is again a matter of emphasis. It is assumed that production must increase, before there is an express consideration of how increasing production could lead to better access for those who need it most.

An article on the 'new limits to growth' in the *Wall Street Journal*, published in 2008, concluded with the statement that 'the true lesson of Thomas Malthus … isn't that the world is doomed, but that preservation of human life requires analysis and then tough action'.[82] Considering whether, where, and in what way food production must increase is an important part of the analysis in addressing food insecurity and hunger. One of the consequences of not expressly challenging the first two assumptions identified here, is that any 'tough action' against climate-induced hunger will be based on a narrow understanding of the causes of hunger that foregrounds production. The point here is not that increased food production is not necessary in the fight against hunger; it is simply that equally important questions of access to food are left un-posed and unanswered.

Assuming, then, that global food production must increase in order to alleviate hunger, how can this increased production be achieved?

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be seen also in figure 7.1, which shows that most of the available refereed publications relate to climate and production aspects. See also: Chapter 1 at notes 135-139.

[82] Justin Lahart, Patrick Barta, and Andrew Batson, 'New Limits to Growth Revive Malthusian Fears' *The Wall Street Journal*, 24 March 2008, http://online.wsj.com/news/articles/SB120613138379155707, last accessed on 22 July 2015.

2.3 ASSUMPTION 3: AGRICULTURAL BIOTECHNOLOGY IS NECESSARY TO INCREASE FOOD PRODUCTION

If we accept that climate change causes hunger and that the production of food must increase to eliminate hunger, then the next question is how to achieve higher food production levels. Like the previous assumptions, this question is far from straightforward and fraught with controversy. With a rapidly growing world population and continuing depletion of natural resources, the belief that more food must be produced while at the same time conserving natural resources is prevalent; in other words, 'growing more from less'.[83] New biotechnologies in agriculture have often been presented, especially since the time of the Green Revolution,[84] as means of achieving higher crop yields. The specific challenges for agricultural production posed by climate change, and the perceived need to increase production 'have given new impetus to the agricultural biotechnology sector'.[85] Simultaneously, there are ongoing debates about the value of agricultural biotechnologies. These debates include ethical issues with genetically engineering food,[86] and more practical questions about the effectiveness of agricultural biotechnologies in actually producing high yields.[87] The argument in this section is that international law as it is invoked in narratives of climate-ready seeds contributes to maintaining this third assumption, notwithstanding the controversies.

Seed corporations and those in support of climate-ready seeds allege that the development and use of new biotechnologies in agriculture is an effective way – and some might say the *only* way – to increase food production with limited natural resources, including land.[88] Biotechnology corporations advocate the idea that genetically engineered, climate-resilient seeds

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[83] See, for example, the following references: EuropaBio, 'Why Do We Need to Produce More Food from Less Land?', http://www.europabio.org/why-do-we-need-produce-more-food-less-land, last accessed on 22 July 2015; Syngenta, 'Grow More from Less: Contributing to Food Security', http://www.syngenta.com/global/corporate/en/grow-more-from-less/Pages/grow-more-from-less.aspx, last accessed on 22 July 2015; CGIAR Consortium, 'Producing More Food Using Less Land: How Can Science Help?', http://www.cgiar.org/consortium-news/producing-more-food-using-less-land-how-can-science-help/, last accessed on 22 July 2015.

[84] Chapter 1 at notes 150-151.

[85] Abergel, note 8 above, 27.

[86] See Chapter 3, part 1, for a discussion of the contentions relating to genetically modified organisms and especially foods.

[87] See the reports by the Union of Concerned Scientists: Doug Gurian-Sherman, 'Failure to Yield: Evaluating the Performance of Genetically Engineered Crops' (Cambridge, MA: Union of Concerned Scientists, 2009). See also: Chapter 1 at note 198. Doug Gurian-Sherman, 'High and Dry: Why Genetic Engineering Is Not Solving Agriculture's Drought Problem in a Thirsty World' (Cambridge, MA: Union of Concerned Scientists, June 2012). See also: Chapter 1 at note 200.

[88] See, for instance, a report published recently by the International Food Policy Institute about the role of agricultural technologies in attaining food security: Mark W. Rosegrant et al., *Food Security in a World of Natural Resource Scarcity: The Role of Agricultural Technologies* (International Food Policy Research Institute (IFPRI), 2014), http://www.ifpri.org/sites/default/files/publications/oc76.pdf, last accessed on 22 July 2015.

are necessary to increase food production in the face of climate change.[89] Academics such as Collier and Paarlberg also underline this idea, by arguing that without biotechnology it would not be possible to achieve adequate food production for a growing population faced with the impacts of climate change.[90] 'Without biotechnology, we'll starve' is the cataclysmic message.[91]

However, serious and legitimate doubts have also been raised about the performance of genetically engineered – and especially abiotic stress-resistant – crops, in terms of yields. The Union of Concerned Scientists has published two reports based on research that shows that genetically engineered crops have to date not produced higher yields.[92] A genetically engineered 'drought-resistant' corn developed by Monsanto under the name of DroughtGard (MON87460) was allowed for commercialization in the US in December 2011.[93] However, even the US Department of Agriculture, after testing this new corn variety, admitted that 'equally drought resistant corn varieties produced through conventional breeding techniques are readily available and may be cultivated in lieu of MON87460'.[94] Organizations such as GM Watch have argued that there are many more non-genetically engineered seeds that have proven successful in drought-resistance.[95] For all these apprehensions about the ability of agricultural biotechnologies to produce higher yields, the way in which international law is framed and invoked in narratives of climate-ready seeds foregrounds the idea that these seeds are necessary to increase food production, and leaves valid criticisms underexposed.

Climate change adaptation law stimulates the use of technologically informed adaptation strategies. The UNFCCC and the Kyoto Protocol refer to 'technology' in very broad terms;[96] nevertheless, reports and papers published under the auspices of the UNFCCC and the IPCC

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[89] See Chapter 1, section 3.2.1.

[90] Paul Collier, 'The Politics of Hunger' *Foreign Affairs* 87 (2008), Chapter 1 at note 194. Robert L. Paarlberg, *Starved for Science: How Biotechnology Is Being Kept out of Africa* (Cambridge, MA: Harvard University Press, 2008). See also: Chapter 1 at note 193.

[91] Martina McGloughlin, 'Without Biotechnology, We'll Starve' *Los Angeles Times*, 1 November 1999, http://articles.latimes.com/1999/nov/01/local/me-28638, last accessed on 22 July 2015. See also: Chapter 3 at note 67.

[92] UCS reports, note 87 above.

[93] See the announcement of the approval in the news archives on the USDA/APHIS website: United States Department of Agriculture – Animal and Plant Health Inspection Service, 'USDA Announces Biotechnology Regulatory Actions', http://www.aphis.usda.gov/newsroom/2011/12/brs_actions.shtml, last accessed on 22 July 2015.

[94] USDA/APHIS, 'Monsanto Company Petition (07-CR-191U) for Determination of Non-regulated Status of Event MON 87460' (November 2011), 33, www.aphis.usda.gov/brs/aphisdocs/09_05501p_fea.pdf, last accessed on 22 July 2015.

[95] GM Watch, 'Non-GM Successes: Drought Tolerance', http://www.gmwatch.org/component/content/article/31-need-gm/12319-drought-resistance, last accessed on 22 July 2015.

[96] See the discussion about references to 'technology' in the texts of the UNFCCC and Kyoto Protocol, Chapter 2, section 2.2.1

elaborate on the importance of agricultural biotechnologies.[97] The authors of these reports may caution against overreliance on technological 'fixes',[98] but the overall perspective seems to be that agricultural biotechnologies (explicitly including genetically engineered seeds) are valuable adaptation strategies.[99] On the whole, climate change adaptation law appears to be favourable to the idea that agricultural biotechnology is necessary to increase food production.

Intellectual property law is also generally supportive of this assumption. Patent rights on seeds have emerged hand-in-hand with new agricultural biotechnologies. The ability to genetically modify plants has opened the door for classifying these living materials as patentable subject-matter. The requirement to provide patents or a *sui generis* form of property protection on plant varieties in the TRIPS Agreement indicates an implicit acceptance of the development and use of agricultural biotechnologies. So far the obvious story. What is perhaps more interesting is that international law invoked to oppose patent rights on seeds tends not to challenge the development and use of biotechnologies directly.

The Convention of Biological Diversity (CBD) is an international and legally binding document that aims to regulate biodiversity conservation.[100] The CBD contains several references to biotechnologies.[101] Its main objective is to regulate the use of biotechnologies, rather than reject them altogether.[102] Article 19 of the CBD stipulates the 'handling of biotechnology and distribution of its benefits'. In this sense, the text of the CBD suggests that biotechnologies are necessary in conserving biological diversity, as long as the benefits of these biotechnologies are distributed equitably.

Calls for the recognition of farmers' rights in opposition to corporate patents aim primarily at achieving recognition of the contributions made by farmers to maintaining biodiversity and sustaining food production.[103] Farmers' rights are about recognizing *rights*. The most immediate aim does not appear to include questions about whether agricultural

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[97] Chapter 2, section 2.2.2.

[98] See Chapter 2, section 2.1, especially : Daniel Sarewitz and Richard Nelson, 'Three Rules for Technological Fixes' *Nature* 456 (December 2008), Chapter 2 at note 65; John Bellamy Foster, 'Why Ecological Revolution?' *Monthly Review* 61 (2010), Chapter 2 at note 66; John Thompson and Ian Scoones, 'Addressing the Dynamics of Agri-Food Systems: An Emerging Agenda for Social Science Research' *Environmental Science & Policy* 12 (2009), Chapter 2 at note 68.

[99] See, for instance, references to genetically engineered crops as a possible adaptation strategy mentioned explicitly in the IPCC special report from 2000 and the UNFCCC technical paper of 2006. Chapter 2, section 2.2.2., especially at notes 108, 109, 117, and 118.

[100] See Chapter 3, part 3.1.2.

[101] Chapter 3, section 3.1.2, CBD at note 99.

[102] Chapter 3, section 3.1.2, CBD at note 94 cites the objectives of the CBD, which includes conservation of biological resources and access and benefit sharing. Article 2 of the CBD stipulates that: "'Technology" includes biotechnology', United Nations, Convention on Biological Diversity, [1993] A.T.S. 32 / 1760 U.N.T.S. 79 / 31 I.L.M 818 (1992).

[103] See Chapter 3, section 3.1.3.

biotechnologies can be useful in increasing food production. Critical narratives of climate-ready seeds tend to place more emphasis on the distribution of proprietary rights than on questioning the necessity of agricultural biotechnologies in increasing food production. Using the language of rights and using international legal discourse is a way to remain part of the conversation on hunger and climate change.[104]

Similar observations can be made in human rights law that is invoked in discussions on climate-ready seeds. Like biodiversity law and farmers' rights, human rights law places strong emphasis on better food distribution: the right to food has been explained as including also physical and economic access to food.[105] Human rights texts also acknowledge and promote the need to realize higher levels of food production. Notably, article 11(2) of the International Covenant on Economic, Social, and Cultural Rights prescribes that States Parties should take measures '[t]o improve methods of production, conservation and distribution of food by making full use of technical and scientific knowledge'.[106] Although there is no mention of biotechnologies, the Covenant does underscore the idea that measures must be taken to improve methods of production. Moreover, De Schutter's report on seed policies and the right to food recognizes the 'considerable contribution' scientific research can make to improving seeds and increasing agricultural production.[107]

Narratives of climate-ready seeds do not expressly emphasize the role of biotechnologies in food production.[108] They do, however, invoke the right to food and work towards realizing this right.[109] Right to food discourse emphasizes the need to regulate and direct biotechnologies towards realizing human rights, rather than questioning the need for these technologies to increase food production. A recent report by the Geneva-based International Council on Human Rights Policy reiterated that:

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[104] See, for example: Craig Borowiak, 'Farmers' Rights: Intellectual Property Regimes and the Struggle over Seeds' *Politics & Society* 32 (2004), 511, where he states that "'rights" have effectively become the only normative game in town'. See also: Chapter 3 at note 136.

[105] Office of the United Nations High Commissioner for Human Rights, 'Special Rapporteur on the Right to Food', http://www.ohchr.org/EN/Issues/Food/Pages/FoodIndex.aspx, last accessed on 22 July 2015, giving a definition of the right to food with an emphasis on access and distribution. See also: Chapter 4 at note 47.

[106] United Nations General Assemby Resolution 2200A, International Covenant on Economic, Social and Cultural Rights (3 January 1976).

[107] De Schutter 2009, note 77 above, 9.

[108] As can be seen in the articulation of the narratives in Chapter 1, section 3.2, there are no big discussions about the role that biotechnologies should play in food production.

[109] See discussion in Chapter 4, section 2.2 and 2.3 about the right to food as employed in narratives of climate-ready seeds; and section 3.2 about the right to food as invoked in relation to seed patents.

> Technology is not, of course, a quick fix to realizing the right to food, but it is an essential element of any lasting solution to increased hunger, particularly in the context of climate change.[110]

As the discussion in Chapter 4 showed, all narratives of climate-ready seeds invoke human rights law, despite recognitions of the limitations of rights-based approaches.[111] Reliance on human rights discourse indicates a certain degree of confidence that rights-based approaches can contribute to devising adaptation strategies that will be effective in the fight against hunger. This confidence can be seen in a larger context of faith in human rights and technologies. Thérèse Murphy has recently edited a book examining common characteristics of human rights and new technologies. She argues that 'hope' is 'the most prominent' of shared characteristics.[112] Notwithstanding serious doubts about the societal value of new technologies and of human rights-based approaches, both are still great sources of hope.

The context of climate change and its predicted devastating impacts on crop yields and hunger sets the stage for renewed hope in human rights and new technologies.[113] Hope appertains to expectations of good results, not necessarily grounded on solid evidence. As climate change adaptation discourse showed, waiting for indisputable scientific evidence of what consequences climate change will have is not an option in devising adaptation strategies.[114] At least for some accounts of climate-ready seeds, hope that new agricultural biotechnologies will be able to prevent widespread hunger appears quite strong.[115]

The overall sense is then that agricultural biotechnologies are necessary to increase food production. This premise is supported, on the one hand, by endorsements of agricultural biotechnologies – including climate-resilient seeds – in adaptation law. On the other hand, legal discourse, as used in critical narratives, tends to leave critical questions about this assumption unposed and unanswered. Biodiversity law and human rights law are primarily framed and invoked

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[110] International Council on Human Rights Policy, 'Beyond Technology Transfer Protecting Human Rights in a Climate-Constrained World' (Geneva, Switzerland: International Council on Human Rights Policy, 2011), 93.
[111] See Chapter 4 at notes 27-40 for some criticisms of human rights-based approaches, particularly in relation to neoliberalism.
[112] Thérèse Murphy, 'Repetition, Revolution, and Resonance: An Introduction to New Technologies and Human Rights' in *New Technologies and Human Rights*, ed. Thérèse Murphy (Oxford: Oxford University Press, 2009), 3.
[113] Human rights law is regularly invoked in efforts to devise ways to deal with the impacts of climate change, see Chapter 4, section 1.1. Technologies also play an important part in the struggles to deal with climate change, see Chapter 2, section 2.1 and Chapter 3.
[114] Article 3(3) UNFCCC stipulates that 'lack of full scientific evidence' should not be taken as an excuse to forego climate action.
[115] Particularly the narrative that holds that climate-ready seeds will be able to combat hunger in the face of climate change, see Chapter 1, section 3.2.1.

to regulate the development and use of agricultural biotechnologies, and not in first instance to question their necessity.

Dmitri Uzunidis has described a phenomenon whereby value is attributed to technological innovations before the functionality and use of these innovations is proven. He calls this '*normalisation par anticipation*'.[116] This phenomenon could be applied to narratives that promote climate-ready seeds: the development of these seeds is normalized through their anticipated value, even though scientific evidence of their 'climate-readiness' is lacking. Despite the existence of counter arguments, as illustrated in narratives that reject climate-ready seeds as a means to fight climate-induced hunger, the argument here is that the way in which international law is employed in critical accounts reinforces the assumed value of agricultural biotechnologies.

Notwithstanding valid claims that agricultural biotechnologies have not led to higher crop yields,[117] the way in which international law is framed and invoked in critical narratives falls short of engaging effectively with these claims. The different areas of international law invoked in narratives of climate-ready seeds give emphasis to the value of agricultural biotechnologies for food production. Critical accounts that question the capacity of climate-ready seeds to aid in the fight against hunger, but the legal arguments they invoke do not highlight criticisms about the necessity of agricultural biotechnologies in increasing food production.

The third assumption upheld in the midst of controversies is that agricultural biotechnologies are necessary to increase food production. This assumption is situated in the middle of the pyramid.[118] Leaving the necessity of agricultural biotechnologies to increase food production in the face of climate change unchallenged reinforces the foregoing assumptions that climate change causes hunger and that increased food production is necessary to eradicate hunger. Supposing that agricultural biotechnologies are necessary to increase food production and eradicate hunger, the next question is: Who will invest in the research and development thereof?

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[116] Dimitri Uzunidis, 'Les Facteurs Qui Font De La Science Une Force Productive Au Service Du Capital' *Innovations* 17 (2003), 40. Emphasis added.

[117] See, for instance, reports by the Union of Concerned Scientists that doubt the effectiveness of genetically engineered crops to produce higher yields at note 87 above; and doubts about the drought-tolerance of Monsanto's drought-tolerant maize at notes 93 and 94 above.

[118] The pyramid of assumptions is explained in the introduction of part 2 of this chapter .

2.4 ASSUMPTION 4: PRIVATE SECTOR INVESTMENTS IN AGRICULTURAL BIOTECHNOLOGIES ARE NECESSARY TO ERADICATE HUNGER

Public funding for international agricultural research has diminished in recent years.[119] Against the backdrop of declining public funds, the private sector has gained a dominant position in research and development of agricultural biotechnologies.[120] Private sector dominance is evident in the handful of large private seed corporations that perform the majority of research and development of climate-ready seeds. The number of patent applications on climate-resilient traits and seeds is frequently offered as an indication of private sector dominance.[121] Private sector dominance in global food systems is one of the central features of the neoliberal food regime.[122] The role of the private sector in supplying agricultural biotechnologies for the fight against hunger is one of the biggest points of dispute in narratives of climate-ready seeds,[123] and also more broadly in debates about the neoliberal food regime.[124] This section will argue that notwithstanding these contestations, international law, as framed and used in narratives of climate-ready seeds, empowers private sector engagement and investment in agricultural biotechnologies as adaptation strategies.

Opponents of the notion that climate-ready seeds can be conducive to eradicating hunger direct a lot of their criticism at the dominant role of seed corporations. The ETC Group has referred to the handful of large seed corporations as 'Gene Giants', alluding to the large number of patent applications they file on engineered genetic traits.[125] In public discourse, it is difficult to find any positive news about agricultural biotechnology. There are many

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[119] See, for instance: Oxfam International, '40 Per Cent Drop in Climate Change Adaptation Funding Must Prompt Action at Key Meetings Next Week', http://www.oxfam.org/en/grow/pressroom/pressrelease/2013-04-03/40-cent-drop-climate-change-adaptation-funding-must-prompt-action, last accessed on 22 July 2015, Chapter 2 at note 129; Michael Blakeney, 'Recent Developments in Intellectual Property and Power in the Private Sector Related to Food and Agriculture' *Food Policy* 36 (2011), 111, Chapter 3 at note 54.

[120] Blakeney, note 119 above.

[121] See, for instance, in reports by the ETC Group and the OECD, noting both the rapidly rising number of patent applications and the large proportion of those applications from a handful of seed corporations. ETC Group, 'Patenting the "Climate Genes" … and Capturing the Climate Agenda' (ETC Group, 2008); 'Capturing "Climate Genes": Gene Giants Stockpile Patents on "Climate-Ready" Crops in Bid to Become "Biomassters"' (ETC Group, 2010); Shardul Agrawala et al., 'Private Sector Engagement in Adaptation to Climate Change: Approaches to Managing Climate Risks' *OECD Environment Working Papers Series, No.39* (OECD, 2011); Shardul Agrawala et al., 'Adaptation and Innovation: An Analysis of Crop Biotechnology Patent Data' *OECD Environment Working Papers No. 40* (OECD, 2012). See also: Chapter 1, section 3.2, especially at notes 162-171.

[122] Philip McMichael, 'Global Development and the Corporate Food Regime' in *New Directions in the Sociology of Global Development*, ed. Frederick H. Buttel and Philip McMichael (Elsevier, 2005). See also: Chapter 1 at note 73 .

[123] See, for an overview of narratives of climate-ready seeds, Chapter 1, section 3.3.

[124] See discussions about the neoliberal food regime, in Chapter 1, section 2.2; and food sovereignty as a resistance to the neoliberal food regime in Chapter 1, section 2.3.

[125] ETC Group 2010, note 121 above. See also: Chapter 3 at note 70.

demonstrations against corporations such as Monsanto.[126] Nevertheless, the argument that will be made here is that the international legal framework relevant to discussions about climate-ready seeds and the neoliberal food regime enable private sector engagement, and thereby empower the private sector.

Climate change adaptation law creates a fertile environment for private sector engagement in adaptation strategies. It appears to extend an invitation to the private sector to be actively involved in adaptation.[127] This enablement and invitation are not explicit, but rather a gradual and subtle process. Looking at the development of adaptation law and discourse over recent years, there is a very clear rising trend of stimulating private sector engagement.[128] This invitation extended to the private sector through adaptation law is closely related to the value attributed to agricultural biotechnologies in adaptation.[129] Adaptation law conveys the message that biotechnologies are needed to adapt to climate change, and that private sector investments are needed to develop these biotechnologies. Adaptation law creates space for the private sector to be involved, yet there is little – if any – discussion of this area of law in narratives of climate-ready seeds. Debates on climate-ready seeds focus instead on intellectual property law and human rights law.

Objections against private sector dominance in the research and development of agricultural biotechnologies are frequently articulated in terms of rejections of corporate patent rights. Critics contend that growing private patent applications on climate-ready seeds create a corporate monopoly,[130] and block access to these seeds for those who need them most.[131] The Convention on Biological Diversity is used by critical narratives as a means of opposing private patent rights on plants. Its main aim is to encourage better distribution and conservation of biological resources.[132] The text of the CBD includes the private sector as one of the players involved in achieving this objective. Article 10(e) of the CBD, for instance, encourages

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[126] The latest 'March Against Monsanto' took place on 24 May 2014, with an estimated 2 million participants all over the world. See 'March against Monsanto', http://www.march-against-monsanto.com/, last accessed on 22 July 2015.
[127] See discussion in Chapter 2, section 3.2.
[128] This is evident, for instance, in the increasing involvement of the private sector in international adaptation initiatives. See Chapter 2, section 3.2.
[129] Chapter 2, section 2.2 illustrates the recognition in climate change adaptation law that agricultural biotechnologies are potentially valuable in adapting to the adverse impacts of climate change on agriculture.
[130] See, for instance: ETC Group 2010, note 121 above. See also Chapter 3 at note 70: 'There is no societal benefit when governments allow six corporations to monopolize food.'
[131] International Institute for Environment and Development, 'Seed Industry Ignores Farmers' Rights to Adapt to Climate Change' IIED, 7 September 2009, http://www.iied.org/seed-industry-ignores-farmers-rights-adapt-climate-change, last accessed on 22 July 2015. See also: Chapter 1 at note 213 and Chapter 3 at note 74.
[132] The objectives of the CBD, as stipulated in article 1, are: 'the conservation of biological diversity; the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights to those resources and to technologies; and by appropriate funding'.

'cooperation between … governmental authorities and … private sector in developing methods for sustainable use of biological resources'. Moreover, article 16(4) of this convention holds that States Parties must take appropriate measures 'with the aim that the private sector facilitates access to, joint development and transfer of technology'.[133] The text of the CBD therefore dismisses neither private sector investments nor the potentially valuable contributions the private sector could make in terms of developing agricultural biotechnologies. Instead, it argues above all for better state regulations to direct private sector engagement, and making the best use of private sector investments.

The duty bearers of human rights obligations are states, and thus human rights law emphasizes the duty of states to regulate private sector actions.[134] This applies also to the right to food and agricultural biotechnology companies. The UN Committee on Economic, Social, and Cultural Rights, in its General Comment 12, stresses the obligation on states to 'take appropriate steps to ensure that activities of the private business sector and civil society are in conformity with the right to food'.[135] There has been increasing recognition and acknowledgement that private sector corporations are nevertheless important actors in realizing human rights. This recognition comes from human rights institutions and experts, as well as from corporations themselves.[136] The implicit suggestion seems to be that private sector engagement and investments are acceptable, as long as states make sure that corporations adhere to human rights standards.

Critical accounts of climate-ready seeds cast doubt on the ability of seed corporations to eliminate hunger using patented, genetically modified seeds.[137] The biggest concern is that private sector interests do not coincide with 'public' interests in terms of solving hunger. Henry Shue attests to this when writing that '[i]f there were lots of profit to be made in solving the world's hunger problem, market forces would presumably have sent people rushing in to solve it long ago'.[138] Critics invoke human rights law in an attempt to manage or regulate private sector actions in accordance with human rights standards; in other words, they apply rights-based

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[133] Convention on Biological Diversity, note 102 above.
[134] See, for instance: United Nations Economic and Social Council, CESR General Comment 12: The Right to Adequate Food (Article 11) E/C.12/2000/4 (12 May 1999), Chapter 4 at note 46.
[135] Ibid.
[136] See, for example: UN Guiding Principles on Business and Human Rights: United Nations Office of the High Commissioner for Human Rights, 'Guiding Principles on Business and Human Rights: Implementing the United Nations "Protect, Respect and Remedy" Framework', New York and Geneva 2011, http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf, Chapter 4 at note 76.
[137] Chapter 1, section 3.2.2. and Chapter 3, section 2.2.
[138] Henry Shue, 'Solidarity among Strangers and the Right to Food' in *World Hunger and Morality*, ed. William Aiken and Hugh LaFollette (Upper Saddle River, New Jersey: Prentice Hall, 1996), 128. See also: Chapter 1 at note 215.

approaches.[139] The principal question that is posed is: How do we regulate private sector activities in such a way that human rights are respected and protected?; and not: Do we need private sector investments in agricultural biotechnologies to deal with the problem of global hunger?

As in the discussions on the previous assumptions, the argument consists in subtleties. Critical narratives of climate-ready seeds in the way they invoke law do not explicitly state that private sector investments in agricultural biotechnologies are necessary to eradicate hunger. However, climate change adaptation law, intellectual property law, and human rights law implicitly recognize the value of agricultural biotechnologies, and the role for private sector funds in that regard. The framework of international law as presented here does not articulate explicit challenges to the need for private sector investments in agricultural biotechnologies to combat hunger. Instead, it focuses on the corporate monopoly through patent rights.

It is important to accentuate why it matters that this assumption is sustained. The point is not to draw any hard conclusions about the value of private sector investments in developing agricultural biotechnologies, but the objective is more specifically to consider the discussion about the need for private sector investments in agricultural biotechnologies as part of the bigger story of hunger and climate change. Seed corporations may indeed have the capacity and expertise to develop new biotechnologies for agriculture. This does not automatically mean, however, that these biotechnologies will contribute to alleviating hunger in the face of climate change. The way that law is framed foregoes any serious questioning of this assumption, and thereby has a hand in upholding it.

This assumption must be seen in conjunction with the previous assumptions – to the effect that climate change causes hunger, that food production needs to increase to alleviate hunger, and that agricultural biotechnologies are needed to increase food production. Private sector corporations hold a leading position in developing genetically engineered seeds. The logical inference is therefore that private sector investments in agricultural biotechnologies are necessary to increase food production, and – ultimately – to combat climate-induced hunger. While there is a great deal of controversy on the private sector influence, the international legal framework does not open the door for any strong challenge to this assumption.

The fact that the private sector is involved does not seem to be regarded as the main problem. The primary issue is that the private sector is benefiting disproportionately from

[139] See Chapter 4, especially sections 2.2 and 3.2.

engaging in adaptation strategies, notably through private property rights over seeds. This is the subject of the final assumption which will be discussed next.

2.5 ASSUMPTION 5: INTELLECTUAL PROPERTY RIGHTS ARE NECESSARY INCENTIVES FOR INVESTMENTS IN AGRICULTURAL BIOTECHNOLOGIES IN ORDER TO ERADICATE HUNGER

The fifth and final assumption identified here that is maintained in narratives of climate-ready seeds is that intellectual property rights are necessary incentives for investments in agricultural biotechnologies in order to eradicate hunger. This assumption is situated at the higher end of the pyramid, just below the top in which most of the critical debates are concentrated. It is, like the four previous assumptions, an idea that is much contested. This section will argue that the main contention in discussions on climate-ready seeds is not whether there should be intellectual property rights on seeds *per se*, nor whether these intellectual property rights incentivize innovation. Instead, the main contention, which is the issue in the tip of the pyramid, is more specifically about the high number of patent applications filed by a few corporations.

Plant genetic resources are increasingly the subject-matter of patent rights and similar forms of intellectual property protection. The coming into force of the TRIPS Agreement, and particularly article 27.3(b) thereof,[140] has provided international legal justification for this development. Notwithstanding the factual increase in patent applications on plants and other living organisms, a great deal of debate remains about whether living organisms should be subject to intellectual property protection at all.[141] Critical narratives of climate-ready seeds draw on this wide debate. When patent rights on animals and plants are rejected, the common (and rather catchy) slogan 'No patents on life!' is sometimes used.[142] The ETC Group has called for a suspension of 'the granting of all patents on climate change-related genes and traits'.[143] However, the dominant focus of criticism lies on the monopoly that Gene Giants achieve through these

[140] Article 27.3(b) TRIPS stipulates that '[m]embers shall provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof'. See also: Chapter 3 at note 20.
[141] See Chapter 3, section 1, for a discussion about intellectual property rights on plants and other living organisms.
[142] See, for example: Rebecca Charnas, '"No Patents on Life" Working Group Update', http://www.councilforresponsiblegenetics.org/ViewPage.aspx?pageId=169, last accessed on 22 July 2015; SWISSAID, 'No Patents on Life!', http://www.swissaid.ch/en/no_patents_on_life, last accessed on 22 July 2015; The International Coalition of 'No Patents on Seeds', 'Stop Patents on Plants and Animals!', http://no-patents-on-seeds.org/, last accessed on 22 July 2015. See also: Chapter 3 at note 34.
[143] ETC Group 2010, note 52 above, 2.

patent applications which obstructs access of poor farmers to these seeds, and not on the application of intellectual property rights on seeds *per se*.[144]

To counter strong corporate patent rights on seeds, critics of Gene Giants and their patent applications regularly draw on the concepts of sovereign rights over natural resources, as stipulated in the CBD, and the concept of farmers' rights, as stipulated in the Plant Treaty.[145] Critics use these concepts in an effort to achieve more recognition for the value of developing countries and farmers in maintaining and conserving biodiversity. Sovereign rights and farmers' rights are often not formally recognized as intellectual property rights like patents stipulated in TRIPS. Nevertheless, the main intention in employing these concepts appears to be to achieve some sovereignty and recognition for developing states and farmers; it is not evident through the use of these concepts that there is a strong stance are against the application of intellectual property rights on seeds. The slogan of 'no patents on life' can then be understood in more nuanced terms in this context: patents on life are acceptable, as long as they are not exclusively for corporations.

Human rights law, as it is framed and invoked, does not explicitly challenge the idea that intellectual property rights can be applied to plants and other living organisms. This, of course, does not imply that those employing human rights arguments do not intend to challenge that idea; it merely suggests that it is not an explicit challenge. The discussion of human rights in association with intellectual property rights, and particularly the right to food in connection with patents on seeds, showed that the dominant view of this interrelationship is of the former keeping the latter in check.[146] The discussion in Chapter 4 took note of earlier debates about drug patents and the right to health, and explained that compulsory licenses have been granted to limit the enforcement of patent rights on essential medicines in the case of a public health emergency.[147] It is imaginable that the impacts of climate change on food production in certain regions could also be considered a public emergency, and that seed patents could be limited in the same way drug patents have been. The consequence would then be that patent rights on seeds are limited in certain instances; and not that patents on seeds are rejected altogether.

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[144] See, especially, Chapter 3, section 2.3, which discusses the critical discourse against the application of patent rights on climate-ready seeds. The ETC Group takes a central position in criticizing climate-ready seeds, and their criticism focuses clearly on large seed corporations ('Gene Giants' and 'climate change profiteers', Chapter 3 at notes 72 and 73). Institutions such as the IIED also point at 'corporate control of seeds' (Chapter 1 at note 213 and Chapter 3 at note 74) as the biggest obstacle to adapting to climate change and addressing hunger. Researchers from the University of Wageningen in their assessment of climate-ready seeds focus on 'unjust and unfair assignment of property rights' (Chapter 1 at note 225).

[145] See Chapter 3, part 3.

[146] See Chapter 4, part 3.

[147] See Chapter 4, section 3.1, especially at notes 106-108.

Human rights law is used as a means to direct climate-ready seeds towards the ultimate goal of combating hunger; this is the essence of rights-based approaches.[148] Such approaches are not primarily intended to challenge the assumption that plants in general, and climate-ready seeds in particular, should be subject to private patent rights. Whether plants should be subject to intellectual property protection of some kind is not the central focus of human rights law, and by inference of the discourse that invokes this law. Thus, there is a tendency in all narratives of climate-ready seeds to quietly assume that it is acceptable to subject plants and plant genetic resources to some form of intellectual property protection.

Leaving largely unchallenged the idea that plants could be patentable subject-matter, the foremost part of the fifth assumption is that such intellectual property rights are necessary incentives for investing in agricultural biotechnologies. The possibility for seed corporations to obtain temporary exclusive patent rights over genetically engineered seeds is often considered a key factor in incentivizing private sector investment.[149] The story that has developed is as follows: without patent rights, the private sector would not invest, no new agricultural biotechnologies would be developed, food production would not increase, and (climate-induced) hunger could not be eliminated.[150] The TRIPS Agreement requires States Parties to provide for intellectual property protection – in the form of patents or a *sui generis* system – on 'new plant varieties'. This legal requirement in itself does not indicate that patent rights incentivize investment and innovation. However, legal discourse employed to oppose the application of corporate patent rights on climate-ready seeds does not reject the idea that intellectual property rights could incentivize innovations.

In the same way that patent rights are regarded as necessary incentives for seed corporations to invest, sovereign rights and farmers' rights can also be regarded as incentives, intended to encourage states to preserve and exploit their natural resources and reward farmers for their innovative agricultural skills and products. Against the backdrop of rapidly increasing numbers of patent applications on plant genetic resources, those who oppose this development have 'few avenues of resistance aside from positing rights claims of their own'.[151] Articulating resistance in terms of 'rights' consolidates this line, and thereby makes it more difficult to contest the assumption that intellectual property rights on seeds are acceptable and necessary incentives to invest.

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[148] See, for a discussion of human rights-based approaches, Chapter 4, section 1.2.
[149] See Chapter 3, section 2.2.
[150] This is the cumulative picture that comes out of the pyramid of five assumptions.
[151] Borowiak, note 104 above.

Critics of corporate patents on climate-ready seeds also invoke human rights, particularly the right to food. They employ human rights discourse in efforts to achieve a balance between the dual objectives of intellectual property rights, namely rewarding the creators, on the one hand, and benefiting society, on the other. With the ratcheting up of patent applications by Gene Giants, according to critics such as the ETC Group, the balance has been tipped unjustifiably in favour of seed corporations.[152] Recent debates about the relationship between intellectual property rights and human rights have given attention to this perceived imbalance.[153] The discussion in Chapter 4 elaborated on this link between the two areas of rights, and especially on how discussions on climate-ready seeds interconnect with seed patents and the right to food. The conclusion was that human rights are primarily evoked as a tool through which to correct the imbalance in intellectual property law.[154] In terms of climate-ready seeds, the right to food is used to 'limit the negative impacts' of rising numbers of patent rights on seeds.[155]

What is prioritized in contradictory narratives of climate-ready seeds is that large private seed corporations are filing hundreds of broad patent applications on climate-ready seeds. Questions of whether seeds and plants should be subject to property rights at all, and whether these patent rights are necessary incentives to invest in agricultural biotechnologies, are left in the background.

There is little consideration of the role that law plays in constructing and upholding the existing framework of the debates. The central criticism in narratives of climate-ready seeds, particularly when examining the use of biodiversity law and human rights law, is that corporate patents and the monopoly of seed corporations do not contribute to alleviating hunger in the face of climate change. More fundamental questions of whether plant patents should be allowed at all, and whether patents can incentivize innovations, are for the most part disregarded. Then again, the lack of attention for these underlying questions does not necessarily suggest that this premise is intentionally taken for granted. As was the case in the previous assumptions, the point is that there is some relevance in those matters that are neither explicitly questioned nor expressly challenged.

This fifth and final assumption is situated at the top of the pyramid, and therefore serves to consolidate the foregoing assumptions, each of which was also contested. When it is implicitly assumed that intellectual property rights are necessary to incentivize investments in agricultural

[152] See, for instance, Chapter 3, section 2.3 which discusses the opinion that seed corporations benefit from strong patent rights, but society does not benefit from the innovations in return.
[153] See Chapter 3, section 3.1 in which the relationship between intellectual property rights and human rights is discussed, especially through the example of drug patents and the right to health.
[154] See Chapter 4, sections 3.1 and 3.2.
[155] De Schutter 2009, note 77 above, 12. See also: Chapter 4 at note 123.

biotechnologies, there remains little scope to dispute the foregoing assumptions. Participants in debates on climate-ready seeds draw on international law to construct their accounts of whether this adaptation strategy can alleviate hunger in the face of climate change or not. This legal framework, however, is resistant, and contains assumptions that are silent and powerful at the same time.

2.6 PYRAMID OF ASSUMPTIONS AND THE OVERALL ROLE OF LAW

The question that prompted this analysis was what role law plays in shaping narratives of climate-ready seeds as possible tools to eliminate hunger. The examination was performed on the basis of five contested assumptions. For each of these assumptions, there are legitimate arguments and well-grounded evidence to challenge the premise. In debates on climate-ready seeds, each assumption presents an opportunity to critically assess the framework within which climate-ready seeds are promoted. More broadly, each assumption depicts a contingency in which solutions to hunger can be assessed and reformulated. Each assumption and the influence of law in maintaining it was explored separately here. However, the assumptions are connected as parts of a larger framework in the shape of a pyramid.

The significance of this pyramid structure lay in the examination of the role of law in upholding a certain, broad interpretation of hunger. Although each assumption is highly contested in itself, discussions higher in the pyramid contribute to subduing contestation in foregoing assumptions. Criticisms of climate-ready seeds are directed mainly at patent applications by large seed corporations; this forms the tip of the pyramid. This critical emphasis leaves questions about the necessity of intellectual property rights as incentives for innovation unchallenged. There are evident doubts about the role of the private sector in eradicating hunger, but no explicit challenges to the necessity of private sector investments to supply genetically engineered seeds. There is likewise no express denunciation of the necessity of agricultural biotechnologies in the form of climate-resilient seeds. The most fundamental premises at the bottom of the pyramid concern the need to produce more food to eliminate hunger, and the causal relationship between climate change and hunger. As there is so much debate on Gene Giants and patent rights concentrated in the tip of the pyramid, these fundamental premises hardly receive attention in discussions about climate-ready seeds. The way in which international law is framed, and how it is employed in narratives of climate-ready seeds, fails to provide an effective means to address the contestations of each assumption and contributes to upholding the pyramid.

Important questions to ask and answer are: Why does it matter that this pyramid of assumptions is sustained? And why does the role that law plays matter? These questions will be addressed here consecutively. The problem with upholding the pyramid is that, on its basis, there are only very limited options with regard to how to go about tackling hunger. The intention of this analysis was not to make any judgments about the correctness of each assumption. Having said that, the reason why these particular premises were chosen was precisely because many people question their validity. With each premise that is not explicitly challenged in narratives of climate-ready seeds, the ways in which to perceive hunger and the spectrum of approaches to eliminating hunger become more limited. Implicit acceptance of consecutive assumptions culminates in a concentration of critical debates in the very tip of the pyramid. The broader range of issues lower down in the pyramid, at its base, are removed from view.

The suggestion here is not that hunger will be solved if these assumptions are explicitly challenged. The argument is that taking the contestations within each fundamental assumption seriously will open up a wider range of choices on how to deal with hunger. The danger in too easily letting these questions fade into the background is that alternative ways of understanding and dealing with hunger will be ignored. A narrow understanding of the problem which assumes that climate change causes hunger, that food production needs to increase, that genetically engineered seeds are needed, that private sector investments are needed, and that these innovations will not be realized without intellectual property protection as an incentive, makes it very difficult to even conceive of different, perhaps more effective, ways of eradicating hunger.

Hunger and climate changes have in recent times come to be seen as legal issues, particularly in terms of human rights.[156] At the same time, law is often presented as part of the solution to climate-induced hunger.[157] The Introduction to this thesis included references to law as a 'saviour', as an important part of the answer to climate change and other detrimental environmental impacts.[158] What the analysis in this chapter has shown, however, is that law also plays an important role in shaping the contours of the problem. In a recent publication about the

[156] See Chapter 4, section 2.1.

[157] This is evident in different chapters of this thesis: Chapter 2 illustrates that climate change adaptation law is drafted with the aim to oblige states to 'facilitate adequate adaptation'; Chapter 3 illustrates that some narratives rely on the TRIPS Agreement to apply for patent rights on climate-ready seeds as a proposed adaptation strategy, while other narratives claim sovereign rights over natural resources and farmers' rights to achieve control over resources and recognition of work in conserving resources; Chapter 4 illustrates that human rights are used as a means to devise climate change measures that respect, protect, and fulfil human rights standards, and that the right to food in narratives of climate-ready seeds is used to attain a balance between patent rights and the realization of the right to food.

[158] Introduction at notes 21 and 23.

social and legal dimensions of climate change, Anna Grear articulates the function of law as follows:

> Not only is there a fundamental misalignment between the complexity of climate crisis and the law's reductive tendencies, but law's ideological structure (its deep intimacy with capitalism and its commitment to the centrality of the corporate form) renders law a paradoxical tool at best.[159]

What the analysis in this final chapter of the thesis has shown is that even those critical narratives that reject climate-ready seeds as a 'neoliberal' solution to climate-induced hunger, are not adequately addressing the reductive tendencies of the law they invoke. As the discussions in this research have illustrated, different areas of international law are relevant in discourse on climate-ready seeds. Although distinct areas of law are recognized, the cumulative role of law in creating and maintaining a framework through which to understand and tackle hunger is not considered. One way in which to address the paradox of law's role in dealing with issues concerning climate change – including hunger – is to better understand how law contributes to shaping our understanding of the problems.

Law – in the way it is framed and how it is employed – has a hand in creating and reinforcing a dominant perception of hunger that is based on the framework of assumptions discussed. The Introduction to this thesis explained that 'law' is understood in a broad sense here. Law is a body of practice and thought, it includes legal texts and legal discourse, law in the books and law in action. Law is a reflection of social, political, and economic processes, and it also influences these processes.[160] The conclusions intend to highlight that international law has a function within these larger systems, and that it is worth considering its role therein.

The next and final part of this chapter will return to the predictions about the future of said regime. It will explore the significance of the pyramid of assumptions for possible changes in the neoliberal food regime, and more generally, what role law could play in food regime analysis.

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[159] Anna Grear, 'Towards "Climate Justice"? A Critical Reflection on Legal Subjectivity and Climate Injustice: Warning Signals, Patterned Hierarchies, Directions for Future Law and Policy' *Journal of Human Rights and the Environment* 5, Special Issue (2014), 109.

[160] See the Introduction to this thesis, section 6.

3 INTERNATIONAL LAW AND THE FOOD REGIME

Contradictory accounts of climate-ready seeds as possible means to combat climate-induced hunger are presented in this thesis as exemplifications of certain tensions within the current, 'neoliberal' food regime. The pyramid of assumptions not only reinforces a dominant way of thinking about climate-ready seeds, but also strongly relates to some of the central features of the neoliberal food regime. The conclusions about the role of law in leaving in place the pyramid of assumptions underlying narratives of climate-ready seeds are also relevant for anticipating the possible changes to the neoliberal food regime, and more generally, for understanding the role of law in food regimes.

The neoliberal food regime, as part 1 of this chapter showed, is facing a period of crisis in which some of its main characteristics – notably privatization and corporatization of global food systems, and the application of intellectual property rights to food – are experiencing heavy opposition. In the light of these tensions, food regime theorists are making predictions about the future of the current regime.[161] There are various nuances in these projections, but there is a consensus that the neoliberal food regime must undergo substantial changes in order to devise effective solutions to global hunger.[162] Recall here that Holt-Giménez and Shattuck wrote that '[t]o put an end to hunger, the practices, rules and institutions determining the world's food systems must change. This implies regime change.'[163] Looking at the conclusions about the framework of assumptions sustained, can it be argued that 'practices, rules and institutions determining the world's food systems' have changed or are changing?

The important point for the purpose of this research analysing the role that international law may play in handling the tensions within the current regime. The analysis in this chapter concluded that even though there are significant contradictions in narratives of climate-ready seeds, the international legal framework invoked by all accounts aids in upholding fundamental, underlying assumptions. The perpetuation of these assumptions impedes real changes to this proposed adaptation strategy and presumed solution to hunger. These conclusions can be transposed also to the potentially emerging new food regime: how international law is framed and invoked may also hinder real changes to key features of the neoliberal food regime, as exemplified by climate-ready seeds. The main argument resulting from this research is that, for

[161] See section 1.1 above.
[162] Ibid.
[163] Holt Giménez and Shattuck, note 28 above.

real changes to be realized in global food relations, these strong but subtle tendencies existing in law must be recognized.

There are legitimate reasons to doubt that a food regime dominated by private sector corporations and increasing privatization and commodification of food is capable of addressing the problems of hunger and food insecurity globally. The neoliberal food regime – as well as the neoliberal capitalist economy more generally – has led to a widening divide between rich and poor.[164] Food regime theorists have justifiable criticisms of the current, neoliberal regime that purports to achieve food security through free trade and free markets. Food sovereignty movements that oppose this erroneous way of achieving food security, strive to make food security about food *use* and food as a *right*, rather than focusing on the economic value of food as a commodity. The goals contained in food sovereignty movements should be commended and supported, with the ultimate objective to achieve food security and eradiate hunger. Food regime analysis, however, overlooks the resistance of legal structures to bringing about such changes.

There exists currently no examination in literature of legal perspectives of food regime theory.[165] Incorporating legal analysis, as this research has done, could contribute to a more complete understanding of historical food relations, and, more importantly, can lead to better informed projections about future developments and changes in these food relations. In introducing food regime theory in Chapter 1, it was mentioned that food regime analysis is based partly on regulation theory.[166] Friedmann noted that [re]gime means regulation: there exist "rules" which analysts can infer through consistent behaviors of relevant actors: states, enterprises, corporations, social movements, consumers, and scientists.'[167] This thesis has examined the regulations and rules, the consistent behaviours of relevant actors in a debate exemplifying the tensions within the neoliberal food regime. Law – how it is framed and invoked – has a hand in shaping regulations, rules, and behaviours. Taking into account the role that law plays in framing the problem of climate-induced hunger and framing the contours of the debates around the contentious food regime, can contribute to better understanding and analysing current food relations, and predicting and shaping future food relations. Understanding the role of law can assist in the move towards a more sustainable, ecologically-informed food regime, away from the current neoliberal regime.

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[164] See, for instance: Friedman 2015, note 7 above; Abergel, note 8 above; La Via Campesina 2008, note 23 above; Sage, notes 24 and 25 above.
[165] See at note 3 above.
[166] Chapter 1 at note 41.
[167] Harriet Friedmann, 'Moving Food Regimes Forward: Reflections on Symposium Essays' *Agriculture and Human Values* 26 (2009), 336. See also: Chapter 1 at note 121.

CONCLUSION

This chapter has brought together the questions posed and the information presented in foregoing chapters of this research in a logical fashion. The initial premise of this research was that the manner in which hunger is perceived and understood determines the range of possible solutions. Climate-ready seeds and the contradictory narratives exemplify the current neoliberal food regime and the strain on it. Critics of climate-ready seeds and of the neoliberal food regime aim to find better solutions to global hunger in the face of climate change. They employ international law in their efforts. This was particularly evident in Chapters 3 and 4, which discussed intellectual property rights and human rights in relation to climate-ready seeds.

The main argument in this thesis is that international law is a factor in constructing and reinforcing a framework of assumptions underlying perceptions of hunger, and by inference influences the available solutions. These conclusions were reached through an analysis of the relevance and invocation of law in contradictory narratives of climate-ready seeds. The main analysis presented a pyramid of five assumptions. Although there are contentions within each of these assumptions, the claim here is that international law, on account of the way in which it is formulated and used, does not grant much space to challenge them. By far most of the critical discussions about climate-ready seeds are concentrated in the very top of the pyramid, concerning the growing patent application on engineered climate-resilient traits and crops by a handful of seed corporations. So much emphasis on this question takes attention away from the five assumptions situated lower in the pyramid.

Law is invoked most frequently as a tool through which to identify and advocate solutions to hunger. The conclusions of this research show that the range of solutions is limited, in part because of the role that law plays in creating and reinforcing a framework of assumptions that guides certain perceptions of hunger. My intention in this analysis was to lay bare the force of law in guiding our understanding of the problem of hunger. Doing so may encourage those seeking to make real changes to the neoliberal food regime and finding real solutions to hunger to start challenging the legal framework and asking different questions. This might mean falling outside the confines of the popular debates, but regime change also necessitates changing the parameters of the debate. Law is not the sole determining factor in achieving regime change and shaping the way hunger is perceived and approached, but it does play an important, and often underestimated, part.

CONCLUSION

The foregoing chapters have examined the relevance and role of international law in accounts of climate-ready seeds and the neoliberal food regime. The ultimate goal of this research was to investigate the role that law plays in finding ways to combat hunger in the context of climate change. The conclusion will summarize the journey of this research project. The first part will explain how the idea for this research was born and how it developed; and provide an overview of the main arguments of each chapter and a recap of the research findings. The second part of this conclusion will extend the research findings beyond climate-ready seeds and the neoliberal food regime, by applying them to Naomi Klein's latest work on climate and capital and her earlier work on 'disaster capitalism'.

1 HUNGER AND LAW

The end of a research project is a good time to look back and reflect upon what initiated this particular research. What drew me to this topic? How did the thoughts, ideas, and arguments develop? What were the main findings of the research, and why do they matter? I will discuss these questions in the first part of this conclusion.

1.1 HOW IT BEGAN

The starting point of this research was hunger in the context of climate change. The problem of hunger, although by no means a new phenomenon, is receiving renewed attention in the light of the predicted adverse effects of climate change on agriculture and food production. My own interest in this topic developed during the course of my education and became more defined in the period when I worked as a policy officer and legal advisor at the Dutch Ministry of Agriculture, the Ministry of Economic Affairs, and the Ministry of Foreign Affairs in The Hague. In my work at these ministries, I was exposed to questions of sustainable food policy, climate change adaptation, intellectual property law, biodiversity law, and public international law in a number of different projects. While I had not clearly recognized the interconnectedness between these areas at the time of working on seemingly diverse projects, the research space and time granted during my doctoral research allowed me to explore the correlations between them.

As a legal scholar, my main interest lies with the role that international law plays in coping with and attempting to eradicate hunger in the face of climate change. As this obviously

is a vast question, my attention was soon drawn to discussions about climate-ready seeds, and particularly the controversies relating to the application of patent rights to these seeds. My initial focus was therefore on the highly contentious debates surrounding the application of intellectual property rights to seeds. In studying climate-ready seeds, it became clear that conflicting views exist on the necessity of these agricultural biotechnologies for fighting hunger. For the purpose of this research, I classified the most dominant of these views as 'narratives' or accounts of climate-ready seeds. They include narratives that promote climate-ready seeds as tools to combat hunger and narratives that reject climate-ready seeds as such. Although intellectual property law was at first the most evidently relevant area of international law, further exploration revealed the pertinence of climate change adaptation law and human rights law in discussions on climate-ready seeds.

I chose to study the role of international law in finding ways to address hunger through contradictory accounts of climate-ready seeds primarily because of the relevance of a number of distinct areas of law in these accounts. Most of the debates surrounding climate-ready seeds that I found at the early stages in my research revolved around patent rights. Particularly, the rapidly growing number of patent applications by a small group of seed corporations on climate-resilient traits in crops led to heavy criticism of so-called 'Gene Giants'.[1] There are also other areas of international law that are relevant to, and employed in, narratives of climate-ready seeds. The first is climate change adaptation law, which stimulates the use of biotechnologies and private sector engagement in adaptation, and thereby contributes to recognizing climate-ready seeds as an adaptation strategy. The concepts of sovereign rights to natural resources, farmers' rights, and right to food are employed most explicitly in critical narratives in an attempt to oppose strong corporate patent rights. Chapters 2, 3, and 4 discussed these areas of international law as applicable in narratives of climate-ready seeds.

At this point, I had articulated a research question, namely: What is the role of law in finding ways to combat hunger in the context of climate change? I had also found a case study through which to investigate this question, namely the particular accounts of climate-ready seeds. I had yet to identify the theoretical framework within which to place this research. In the midst of investigating the legal perspectives of climate-ready seeds and learning about sociological enquiries into global agriculture, I encountered food regime theory. Food regime theory is defined as an analytical tool to explain the role of agricultural and global food systems in larger

[1] The ETC Group has referred to the dominant seed corporations as 'Gene Giants' because of the high number of patent applications they file on genetic traits in seeds. ETC Group, 'Capturing 'Climate Genes': Gene Giants Stockpile Patents on "Climate-Ready" Crops in Bid to Become "Biomassters"' (ETC Group, 2010). See also: Chapter 3 at note 72.

political, economic, and social global structures. Hunger itself, the way in which it is perceived and the strategies devised to tackle it, can be studied through a food regime analysis. Moreover, the contradictory accounts of climate-ready seeds reflect some of the main tensions existing within the current, neoliberal food regime.

Food regime theory thus became my theoretical framework. The discussions and conclusions about the influence of law in articulating climate-ready seeds as possible tools to fight hunger subsequently became part of a larger question concerning the role of law in food regime theory. Although food regime theory is influential among sociologists, geographers, and other social scientists, legal scholars have largely steered clear of it. Conversely, food regime theorists have not expressly considered the influence of law on food regimes. In addition to demonstrating how law influences the types of solutions devised to alleviate hunger, this research also provided an original legal perspective to food regime theory.

1.2 SUMMARY OF RESEARCH

Chapter 1 set out the main themes and questions that guided this research. The preliminary premise was that the way in which hunger is perceived determines the strategies conceived to deal with it. Consequently, how hunger is explained and understood in the context of climate change determines the adaptation strategies aimed at alleviating climate-induced hunger. Hunger is articulated as a legal issue, most apparently as a threat to, and also as a potential violation of, the right to food. At the same time, law is used as a tool to formulate solutions to hunger. Chapter 1 also introduced food regime theory, and explained the main narratives of climate-ready seeds as exemplifications of the tensions within the neoliberal food regime. The subsequent chapters consecutively discussed climate change adaptation law (Chapter 2); intellectual property law (Chapter 3); and human rights law (Chapter 4). Each chapter described the areas of law relevant for and invoked in different accounts of climate-ready seeds.

Chapter 2 illustrated that climate change adaptation law is a factor in creating an enabling environment for the use of agricultural biotechnologies and the engagement of the private sector in adaptation strategies. Adaptation law, in the way that it is framed and employed, extends an invitation to the private sector to develop agricultural biotechnologies for the purpose of adaptation. Climate-ready seeds are examples of such adaptation strategies. Chapter 3 highlighted the relevance and use of intellectual property law for climate-ready seeds. Intellectual property law, as it has developed in recent decades, has come to view plants and other living things as patentable subject-matter. Particularly the TRIPS Agreement has done a great deal for the

acceptance and normalization of intellectual property rights on (genetically engineered) seeds. The main criticism voiced by the narrative that rejects climate-ready seeds as tools to combat hunger, is that seed corporations are increasingly obtaining patent rights on these seeds. Critics reject corporate patents on climate-ready seeds, and often invoke the concepts of sovereignty over natural resources and farmers' rights. These concepts can be seen as alternative forms of proprietary rights that endeavour to better distribute the benefits and ownership of seeds. Finally, Chapter 4 discussed the relevance of human rights law in discussions about climate change and hunger, and particularly in contradictory narratives of climate-ready seeds. Rights-based approaches are frequently employed in attempts to direct climate-ready seeds towards the goal of combating hunger, with a particular emphasis on the right to food. This chapter revealed that all narratives draw on human rights law to some extent.

In discussing the relevance of international law for climate-ready seeds in these three chapters, neoliberal features – namely commodification, privatization, and corporatization of food – have come to the fore. The storyline that is most pronounced in discourse on climate-ready seeds is that proponents rely on strong patent laws to claim property rights over the seeds, while opponents invoke sovereign rights, farmers' rights, and human rights to counter this corporate monopoly. Proponents of climate-ready seeds seek to reinforce neoliberal features. Meanwhile, opponents often align themselves with food sovereignty movements, and strive to overcome these neoliberal 'solutions' to climate-induced hunger.

Participants in debates about climate-ready seeds employ law almost exclusively as a means of shaping solutions to hunger. This echoes the depictions of law as a 'saviour', mentioned in the introduction to this thesis.[2] Adaptation law is intended to inform and regulate action aimed at adapting to the impacts of climate change – including the adverse impact on agriculture and by inference on hunger. Sovereign rights over natural resources and farmers' rights are invoked as tools to redistribute control over biological resources, with the intention of realizing food security in the face of climate change. The right to food is used as a means to direct seed policies towards combating hunger. The dominant picture is therefore one of law as part of the solution to hunger. In Chapter 1 of this research, it was argued that the perception of hunger defines its solutions. The analysis of this research drew on the descriptions of the distinct areas of law in narratives of climate-ready seeds to argue that law is relevant not only in shaping solutions to hunger, but also in shaping the understanding of the problem of hunger.

[2] See Introduction, notes 21 and 23.

While Chapters 2, 3, and 4 discussed specific areas of law, Chapter 5 examined the cumulative role of law. Chapter 5 returned to the theoretical framework of the neoliberal food regime, and through this framework analysed the overall role of law in finding ways to solve hunger. Critics of climate-ready seeds contend that these seeds will not contribute to combating hunger – at least not if patented by a handful of Gene Giants. These contentions can be seen in the light of criticisms directed at the neoliberal features of the current food regime. Many participants in the discussion maintain that a global food system dominated by a small number of large corporations, and giving priority to commercially viable crops, cannot feed the world population. The climate crisis further fuels these doubts about the adequacy of the current food regime.

A key aspect of food regime theory is that shifts from one food regime to another are triggered by periods of crisis. Considering the crisis facing the neoliberal food regime, theorists predict changes, either in the form of substantial improvements to the current regime or a move towards a new food regime. These expectations about the future of the neoliberal food regime do not take into account the role that law plays in shaping global food relations and in reconciling disputes. As narratives of climate-ready seeds are viewed as reflections of the tensions within the neoliberal food regime, an analysis of the role of law in these narratives has implications for understanding the role of law in the food regime. Chapter 5 analysed the former role of law against the backdrop of predictions about the future of the neoliberal food regime.

1.3 THE RESEARCH FINDINGS

In Chapter 5, the research culminated in the main conclusion that there will be no substantial changes to the way in which we attempt to combat hunger until we scrutinize the framework of assumptions that underlie the way in which we perceive hunger. Law plays an important, but often overlooked, part in upholding these assumptions. The way in which law is framed and how it is invoked by all participants in discussions on climate-ready seeds does not serve to call into question the fundamental premises on which the perception of hunger is based.

The following five assumptions were identified and discussed: (1) climate change causes hunger; (2) increased food production is necessary to eradicate hunger; (3) agricultural biotechnologies are necessary to increase food production; (4) private sector investments in new agricultural biotechnologies are necessary to alleviate hunger; and (5) intellectual property rights are necessary incentives for investments in agricultural biotechnologies to eradicate hunger. Each of these assumptions is highly contested. My argument is that the international legal framework –

as relevant to, and invoked in, narratives of climate-ready seeds – foregrounds some debates over others, and thereby falls short of challenging these assumptions. By far most criticism of climate-ready seeds is aimed at the growing patent applications by seed corporations. Focusing so much attention on this issue assists in leaving other underlying assumptions unchallenged.

The outcomes of this research do not purport to judge each of the assumptions discussed. They each involve enormous and immensely important questions pertaining to hunger and climate change. The intention was neither to question the urgency of climate change, and its adverse effects on agriculture and hunger, nor to undermine worthy efforts to improve the livelihoods of farmers and fight poverty and hunger. The objective was also not to extenuate the accountability of seed corporations in abusing the climate and food crises for their own profit. I cannot say, as I have not studied these issues in-depth, whether climate change causes hunger, whether more food needs to be produced to eradicate hunger, whether agricultural biotechnologies are needed, whether private sector investments are needed to this end, and whether intellectual property rights are needed to incentivize these investments. The point of this study was not to discover whether these assumptions are valid, but rather to establish that the way in which international law is framed and how different actors – NGOs, civil society organizations, human rights experts, academics, journalists, etc. – invoke international law, too often forestalls any serious querying of these assumptions.

This research has contributed to existing literature in a number of ways. Firstly, the aim was to study the cumulative role of law. While Chapters 2, 3, and 4 each studied separate areas of international law, the analysis in Chapter 5 reflected on the overall role of law. This role is evidenced in the representation of the five assumptions which lie at the heart of the analysis as a pyramid. Each assumption is highly contested in itself, and law is relevant to each of these contentious assumptions. However, the main focus was on the connection between these assumptions, and the connection between the employment of law in each of them. The brunt of the criticism in these discussions is directed at seed corporations and the rising number of corporate patent applications on climate-ready seeds. These issues are situated in the tip of the pyramid. Concentrating on these debates contributes to disregarding controversies in the foregoing assumptions lower down in the pyramid, and consequently aids in affirming the central features of the neoliberal food regime. Secondly, this research has applied a legal perspective to food regime analysis. As indicated previously, food regime theory has to date not included legal analysis, and legal scholars have not addressed food regime theory. An understanding of the relevance and role of international law can assist in comprehending the dynamics of the global food system, and can moreover be of use in predicting and directing its future.

The starting point of this research was hunger in the face of climate change. Ultimately, the discussions and conclusions about the role of law in narratives of climate-ready seeds and the neoliberal food regime intended to contribute to an improved understanding of how to combat hunger. What this research has shown is that it is important to understand the role of law in sustaining a certain way of perceiving hunger and a framework of assumptions that underlie solutions to hunger. Working towards better and more effective ways to combat hunger requires a critical examination of the role of law in understanding hunger in the context of climate change.

2 CLIMATE-READY SEEDS AND 'DISASTER CAPITALISM'

This final section of the thesis will broaden the conclusions of this research by arguing that climate change provides a formidable setting for what Naomi Klein has called 'disaster capitalism'. First, I will reiterate that the current/emerging food regime reflects and feeds into neoliberal modes of capital accumulation. Then, I will argue that climate change provides a conducive setting for bolstering neoliberal capitalism. Finally, I will suggest that the conclusions of my research on narratives of climate-ready seeds may also imply something about the role of law in creating and maintaining a framework of assumptions that underlie neoliberal capitalism more generally.

2.1 THE NEOLIBERAL FOOD REGIME AND CAPITAL ACCUMULATION

Climate-ready seeds are exemplifications of the neoliberal food regime, and the neoliberal food regime sets global food relations within larger processes of global governance. The neoliberal food regime articulates a contemporary phase in capital accumulation. The introduction of Chapter 1 explained that food regime theory emerged expressly to explore the role of agriculture and global food systems 'in the construction of the world capitalist economy'.[3] Food regime theory can be understood as being much less about food in itself, than about food as a means of capital accumulation.[4] Colin Sage has written the following about food regime theory:

[3] Philip McMichael, 'A Food Regime Genealogy' *The Journal of Peasant Studies* 36 (2009), 139. See also: Chapter 1 at note 39.
[4] Farshad Araghi, 'Food Regimes and the Production of Value: Some Methodological Issues' *Journal of Peasant Studies* 20 (2003). Araghi writes, for instance, that 'global agriculture and food are inseparable from the reproduction of

> Food regime analysis combines political economy, political ecology and historical analysis to explain how particular relations of food production and consumption are central to the functioning and reproduction of global capitalism (Holt-Giménez and Shattuck, 2011). It is an approach which is less concerned with food as object than with the multiple interconnections and relations to which food commodities give rise including social, cultural and ecological consequences (McMichael, 2009a).[5]

The conclusions that I have drawn about the role of law in upholding assumptions underlying questions about hunger in the context of climate change, can be extended to the role of law in maintaining certain modes of capital accumulation. Criticisms of Gene Giants and of the corporatization of global food relations reflect broader criticisms of the way in which capital is accumulated through food commodities. The broader criticism is that, while corporations benefit from the market value of biological resources such as seeds, this form of capital accumulation does not benefit those most vulnerable in society.[6]

2.2 CLIMATE CHANGE AND DISASTER CAPITALISM

In her 2007 book, *The Shock Doctrine: The Rise of Disaster Capitalism*, Naomi Klein sets out to show how situations of disaster are used (or *ab*used) to enforce controversial political or economic reforms that strengthen forms of capital accumulation. These reforms correspond closely to the key features of the neoliberal food regime: free markets, privatization, the concentration of power and wealth in the hands of a few.[7] Klein refers to the advancement of such reforms in the context of crisis as 'disaster capitalism'.[8] This concept can be applied to a great number of situations, to different kinds of 'disasters'. The key point – regardless of how the situation came about – is that some people exploit times of crisis by furthering policies that otherwise might not have been implemented, while most people are distracted by the impact and ramifications of the

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labour power' (page 51), and that 'world historical forms of imperialism have been related to food regimes of capital and the production of value on a world scale' (page 61).

[5] Colin Sage, 'The Interconnected Challenges for Food Security from a Food Regimes Perspective: Energy, Climate and Malconsumption' *Journal of Rural Studies* 29 (2013), 73. See also: Chapter 5 at note 24.

[6] McMichael has argued that 'the centrality of the food regime in the twenty-first century' is the objective to 'transcend the increasingly discredited episteme of capital accumulation and advocate agricultural reorganisation according to socially and ecologically sustainable practices'. McMichael, note 3 above, 164. See also: Chapter 1 at note 102.

[7] See, for an elaboration of the neoliberal food regime and neoliberalism more generally, Chapter 1, section 2.2.

[8] Naomi Klein, *The Shock Doctrine: The Rise of Disaster Capitalism* (London: Allen Lane, 2007).

disaster itself. This is perhaps best illustrated through some of the examples that Klein provides in her book.

One of the earliest examples of disaster capitalism is the reforms implemented in Chile after the overthrow of President Allende by General Pinochet in 1973. The coup led to a serious economic crisis in Chile. With support from the US, and particularly under the guidance of Chicago-school economist Milton Friedman, Pinochet implemented sweeping reforms in Chile. These reforms notably included the privatization of formerly state-owned institutions, and the elimination of trade barriers in line with free trade ideals. Resistance to these radical reforms was harshly quashed through torture and disappearances, leading to thousands of deaths. The situation of 'crisis' or disaster in Chile was a result of the coup d'état, and this situation was exploited to further free market reforms.[9]

A more recent example was observed in the aftermath of Hurrican Katrina, which devastated New Orleans in 2005. Klein has referred to reforms that were implemented in the aftermath of the hurricane as 'one of the most shameless examples of disaster capitalism'.[10] The hugely destructive hurricane ravaged the already vulnerable infrastructure and the lives of the people of New Orleans. This situation of chaos and utter shock was, according to Klein, a fertile ground for pushing forward unpopular measures under a guise of good intentions. During the rebuilding of New Orleans, many of the city's public housing projects were closed down and replaced by development projects, such as expensive hotels. Many public schools were also replaced by private schools. The consequence was that, while new developments happened and schools were built, this in no way benefited the majority of the city's population. Although the examples of Chile and New Orleans are very different, both clearly show how situations of crisis are used to strengthen free market ideals and to enforce privatization measures, furthering modes of capital accumulation.

At the end of *The Shock Doctrine*, Naomi Klein refers to climate change as a disaster that could potentially be abused to reinforce free market ideals and forms of privatization. Her most recent book, *This Changes Everything: Capitalism versus the Climate*, elaborates on climate change policies that can be considered prime examples of disaster capitalism.[11] The tenor of Klein's latest book is that contemporary 'capitalism' cannot provide the solution to the enormous and detrimental consequences of climate change. It is a forceful message that predicts little good for

[9] Ibid.
[10] Naomi Klein, 'The Shock Doctrine in Action in New Orleans' *The Huffington Post*, 25 May 2011, http://www.huffingtonpost.com/naomi-klein/the-shock-doctrine-in-act_b_77886.html, last accessed on 22 July 2015.
[11] Naomi Klein, *This Changes Everything: Capitalism versus the Climate* (London: Allen Lane, 2014).

the world if neoliberal forms of capital accumulation remain at the heart of global policies. At the same time, Klein expresses hope that it is not yet too late to change the course of action away from capital accumulation through free markets and privatization to more sustainable ways of dealing with the impacts of climate change. Klein presents climate change as the wake-up call to make us realize that our current path of contemporary capitalism will destroy us.

Critical narratives of climate-ready seeds as an adaptation strategy and a solution to climate-induced hunger can be viewed in the light of Klein's argumentation in *The Shock Doctrine* and *Capitalism versus the Climate*. Critics of climate-ready seeds accuse seed corporations and the governments supporting them of abusing the climate and food crises to accumulate capital value through biological resources. The ETC Group refers to seed corporations as 'climate change profiteers'.[12] Hope Shand, research director of the ETC Group, has stated that:

> In the face of climate chaos and a deepening world food crisis, the Gene Giants are gearing up for a PR offensive to re-brand themselves as climate saviours' [and that] The companies hope to convince governments and reluctant consumers that genetic engineering is the essential adaptation strategy to insure agricultural productivity. Monopoly control of crop genes is a bad idea under any circumstances – but during a global food emergency with climate change looming – it's unacceptable and must be challenged. [13]

The 'chaos' of climate change and the food 'crisis' form the ideal backdrop for Gene Giants to sweep in under the guise of contributing to climate change adaptation and alleviating the global hunger problem through genetically engineered foods, which is controversial. Klein has adopted the ETC Group's critical rhetoric in her latest book. She mentions 'climate-ready seeds', and echoes the concerns voiced by the ETC Group about corporate domination of these adaptation technologies.[14] Climate change can, therefore, be viewed as a situation of disaster that could potentially be abused by seed corporations and others who intend to further entrench modes of neoliberal capitalism.

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[12] See, for example: Geofrey Lean, 'Biotech Giants Demand a High Price for Saving the Planet' *The Independent*, 8 June 2008, http://www.independent.co.uk/environment/climate-change/biotech-giants-demand-a-high-price-for-saving-the-planet-842480.html, last accessed on 22 July 2015; ETC Group, 'News Release: Gene Giants Grab "Climate Genes": Amid Global Food Crisis, Biotech Companies Are Exposed as Climate Change Profiteers', 13 May 2008, http://www.etcgroup.org/fr/node/688, last accessed on 22 July 2015. See also: Chapter 3 at note 73.
[13] ETC Group 2008, note 12 above.
[14] Klein 2014, note 11 above, 9.

Critics of climate-ready seeds and, more generally, food sovereignty movements and food regime theorists, are struggling to resist further corporatization and privatization of agriculture and to work towards more sustainable, ecologically informed, localized forms of food production.[15] These efforts can be seen as depicting specific sites of resistance against neoliberal capitalism. In her 2014 book, Naomi Klein conveys confidence that a radical overhaul of our political and economic systems, directed away from contemporary capitalism, is attainable. Next, I will apply my research findings about the role of international law to Klein's call for a move away from neoliberal capitalism.

2.3 LAW, CLIMATE CHANGE, AND CAPITALISM

This research has argued that law influences the framing of hunger as a problem, and all participants in the discussion about climate-ready seeds invoke law to advocate their solutions to hunger. The findings of this research illustrate that most of the attention for the role of law is given to law as a means through which to formulate solutions. The influence of law on sustaining a framework of fundamental assumptions is underestimated. The argument in this thesis is that the role of law in framing the problem must also be scrutinized. Without such scrutiny, it will be difficult to move towards solutions to hunger that do not implicitly reinforce modes of capital accumulation based on privatization and free markets.

I extend these research conclusions here by suggesting that international law – how it is framed and invoked – also has a hand in creating the backdrop of 'chaos' and 'crisis' associated with climate change, and particularly its impacts on food security and hunger. Climate change adaptation law, intellectual property law, and human rights law in particular are instrumental in constructing climate change and hunger as 'crises'.[16] The way in which different areas of law are framed and employed moreover expressly invite private sector engagement, encourage the development of biotechnologies in agriculture to adapt to the effects of climate change, and reinforce the idea that food production must increase to tackle climate-induced hunger. By leaving in place certain fundamental assumptions and a framework of understanding the problem of hunger in the face of climate change, law contributes to creating an enabling environment for Gene Giants to use climate change and hunger as 'disasters' through which to further entrench privatization and commodification of seeds.

[15] See discussion in Chapter 5, section 1.1.
[16] Discussions in Chapters 2, 3, and 4 of this research show that the these fields of law frame climate change as a crisis, and that urgent action must be taken to overcome the projected effects of climate change on hunger.

Chapter 5 of this research argued that the pyramid of five assumptions forms the foundation of climate-ready seeds, and part of the foundation of the neoliberal food regime. This also reflects assumptions on which contemporary forms of capital accumulation are based. The analysis in Chapter 5 showed that most of the controversy over climate-ready seeds is concentrated in the tip of the pyramid, concerning corporate patent applications. There is a similar tendency in discourse on disaster capitalism. Critical emphasis is mostly given to the corporations and institutions who exploit 'disasters' – such as climate change. Much less attention is given to how these disasters are created, and thus how law is conducive to creating an enabling environment.

Klein's conception of disaster capitalism has been influential in identifying and discussing the shortcomings of our contemporary political and economic system based on forms of capital accumulation. It has moreover highlighted the opportunities provided by 'disasters' to strengthen this system instead of contravening it. The very same disasters that reveal the failings of contemporary capitalism are also fertile breeding ground for reinforcing the fundamental framework of capitalism. The conclusion about the role of law in constructing a certain framework, a certain way of thinking about hunger and climate change, are also relevant in taking the efforts to resist disaster capitalism one step further. For resistance movements to oppose disaster capitalism, and move towards a system beyond neoliberal capital accumulation, the underlying framework of assumptions and the influence of law in maintaining this framework must be taken into account.

Attention for the role of law as called for in this research can strengthen the understanding of the processes of disasters capitalism, and thereby contribute to devising more effective solutions. In order to prevent hunger in the face of climate change to become a favourable condition for crisis within which to reinforce and expand modes of capital accumulation at the expense of the vulnerable, hungry, and impoverished, the role that international law plays in creating such a convenient context for exploitation needs to be considered more seriously. The process of challenging corporate monopolies and instances of disaster capitalism should also include exhaustive questioning of the legal framework. The conclusions of this research are therefore neither limited to international law in narratives of climate-ready seeds and the neoliberal food regime, nor restricted to the role of law in defining the problem of hunger and in devising ways to fight hunger. The conclusions can be transposed to considerations of the influence of law in upholding thought patterns about how we govern our world. Changing this thinking necessitates a consideration of the international legal system, and how we employ legal discourse.

3 FINAL WORDS

During the course of my doctoral research, I have often been asked questions along the lines of: But don't you agree that Monsanto is terrible? Or (though with much lower frequency): But are you denying that biotechnologies have had positive impacts on agriculture and food production? I regularly sensed a desire on the part of my audience for me to position myself 'in favour of' climate change action or 'against' climate change action; 'in favour of' genetic engineering or 'against' genetic engineering; 'in favour of' corporatization and privatization or 'against' corporatization and privatization. The truth is, however, that I do not have answers to these questions. It was not my intention to formulate answers to these questions in this research, or to find the best solutions to these contradictions. My argument is that it is not enough to be 'in favour of' or 'against' these matters. There are questions that need to be deliberated on before the above questions are even relevant. These prior questions are encapsulated in the framework of assumptions that was discussed in Chapter 5. The questions that are posed inform the terms of reference of the debate on climate change, hunger, climate-ready seeds, and the neoliberal food regime. My primary intention in this research was to reveal the role that international law plays in obscuring the preceding questions, thereby maintaining the framework within which we attempt to combat climate change-induced hunger.

There is, and always has been a great deal of debate on how to deal with hunger. The exigency of climate change and its projected impacts on food production has intensified the perceived need to take action against hunger. It has also further exacerbated the contradictions between ways to address hunger. There are valid and well-grounded arguments explaining why climate-ready seeds will not contribute to combating hunger in the face of climate change. They likewise reflect valid and well-grounded arguments against contemporary forms of capital accumulation – what Harvey refers to as 'accumulation by dispossession'[17] – that benefit large corporations and wealthy governments, and disadvantage the growing group of the world's poor and vulnerable.

Whilst I sympathize with these arguments, I find it problematic that critical debates on climate-ready seeds, and neoliberal forms of capital accumulation more broadly, direct so much of their attention towards 'bad climate', 'bad corporations', and 'bad governments' without sufficiently questioning the nature of 'bad system'. Klein, in her articulation of the 'shock doctrine' and 'disaster capitalism', recognizes the importance of the construction of a situation of

[17] David Harvey, *The New Imperialism*, 2003 ed. (Oxford: Oxford University Press, 2003), 145. See also: Chapter 1 at note 73.

shock, crisis, and disaster. In her latest book on climate change and capitalism, Klein presents climate change as potentially being the ultimate crisis that could bring capitalism down. Regarding trade deals, Klein writes that 'the real problem is not that trade deals are allowing fossil fuel companies to challenge governments, it's that governments are not fighting back against these corporate challenges'.[18] This same argument can be made for the corporate monopoly over climate-ready seeds. The main thrust of my research, however, is that the discussion still focuses too much on the exploitation of the disaster, in this case climate change and hunger, and not enough on the construction of an enabling environment in which certain actors are able to further strengthen modes of capital accumulation.

International law contributes to framing contexts of crisis and disasters. This research has indicated the way in which international law reinforces the urgency of climate change impacts, particularly on food security and hunger. In itself, this is not problematic. However, we must be aware that this context of urgency can be conducive to certain, perhaps not so desirable, solutions. Needless to say, I do not imagine that a critical examination of international law will solve the problem of hunger, and bring about an instant overhaul of neoliberal forms of capital accumulation. I also do not imagine that challenging the structural tendencies in international law alone can prevent the doomsday scenario, as presented in the Introduction.[19] However, I strongly believe that understanding the unyielding influence of law on framing the problem of hunger in the context of climate change is necessary to challenge this perception. Keeping a range of options on how to end hunger in the face of abundance on the table first requires a comprehensive understanding of the problem.

In the conclusion of her latest book, Naomi Klein writes that 'a great deal of work of deep social change involves having debates during which new stories can be told to replace the ones that have failed us'.[20] International law itself tells stories about climate change, about hunger, about how we understand these problems, and how we should go about solving them. International law is also an obstacle to the generation of new stories, be it intentional or not. My thesis reveals some of the stories that international law tells, and calls for concerted efforts to challenge the resistance of law, and formulate new stories.

[18] Klein 2014, note 11 above, 360.
[19] See Introduction at notes 1 and 2.
[20] Klein 2014, note 11 above, 461.

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