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POWERING THE FUTURE: ENERGY RESOURCES IN SCIENCE FICTION AND FANTASY

'Food from Nowhere': Food, Fuel and the Fantastical

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Science fiction (sf) has repeatedly explored the social and environmental consequences of technological developments in food and energy production. Never before have these explorations been of more importance and significance; recent shifts in resource extraction and processing (by both fossil fuel and 'biofuel' companies) have dramatically increased the reach and destructiveness of industrial food and energy production, as well as the extent of their entanglement. This article will begin by giving an indication of the reach and impacts of modern biofuel production, followed by a brief examination of the 'food sovereignty' movement and the theoretical frameworks and practical strategies that underpin it.

Through the lens of the 'food sovereignty' movement, the article examines the ways in which sf writing and culture has explored the entanglement of food and energy regimes. Taking three aspects developed from the 'six pillars' of food sovereignty – political power, ecological integration and the fantastical – I examine three sf texts which place at their centre concerns over the entanglement of food and energy regimes. As I go on to demonstrate, all three texts – Robert A. Heinlein's *The Moon is a Harsh Mistress* (1966), the British post-apocalyptic TV show *Survivors* (1975–7), and Paolo Bacigalupi's *The Windup Girl* (2009) – use elements of the fantastical to explore and make visible effects which are rarely seen or only understood in the abstract language of international political economy. I then conclude by reflecting on the urgent need apply these insights in the struggle for a fairer and more sustainable food system.

Introduction

Science fiction (sf) has consistently provided fertile ground for speculative thinking about fuel. From warp drives in *Star Trek* (1966–present), to garbage-fuelled time-travel in *Back to the Future* (1985–90), novel ways of running transport and powering industry are hard-wired into the fantastical imaginary. The same can easily be said of food – from the cliché of 'a meal in a pill' (Langford, 2016) to the infamous plot twist in *Soylent Green* (1973), food technologies in sf have continually animated discussion about how future societies will operate. By exploring the interconnections between food and fuel in sf, this article will reveal how these relations provide a novel means to: 1) concretise the often-confounding complexity of modern agricultural production; 2) contest the inevitability of environmentally and socially destructive foodways; and 3) provide credibility for contemporary forms of agrarian resistance. Food and fuel systems in sf offer more than incidental detail for world-building; their interpretation can offer a way to explore the food-dependent contingencies of contemporary political economies.

In a simple sense food *is* fuel; calorific power propelling the bodies and minds of our real and imagined worlds. In this sense food is a vital component in a (theoretically) circular energy regime. As Philip McMichael puts it, 'capitalism itself is a food regime, insofar as its reproduction depends on the provisioning of foodstuffs necessary to the (economical) reproduction of its labor force' (McMichael, 2016: 661). However, as the capitalist mode of agricultural production has intensified and expanded, deep cracks have begun to emerge. 'The Green Revolution' of the mid-20th century onwards, for example, was very much an energy-driven project, marking a period notable for its steady erosion of producer autonomy (McMichael, 2008) and a widening rift between production and ecological capacities (Moore, 2000). In short, such developments have proved costly in the extreme, precipitating what McMichael (2014) describes as a contemporary 'crisis conjuncture' of deepening social and environmental problems.

In the context of such cascading crises in the food system (and beyond), a new critical sensibility that challenges energy intensive modes of production has

gathered momentum. However, against the backdrop of the gargantuan machine of the Corporate Food Regime (CFR) (McMichael, 2015), small-scale agrarian resistance can appear not only heavily outgunned, but is also vulnerable to reductive attacks (e.g. Aerni, 2011). Those contesting the CFR do battle not only against world-historical assemblages of industrial capital, but also other forces almost impossible to grasp: as Jean Retzinger puts it, many of the most destructive agricultural practices, 'far removed from urban population centers and carried out under the banner of efficiency in our names, are for the most part rendered invisible' (Retzinger, 2008: 384). In the effort to contest the inevitability of the CFR and push the envelope of what is considered politically possible, I want to contend here that sf contributes a useful set of lenses. Adopting an approach to the food system informed by sf must be seen in terms of the genre's appeal to a 'speculative' or even 'unthinkable' re-visioning of the world, an outlook shared by the discontents of the CFR (such as the food sovereignty movement) as they attempt to present the terms of an agroecological and democratically-determined food system. Ordinarily, pointing out the 'unthinkable' might be seen as counter-productive to social movements; however, as I will go on to argue, drawing on the speculative prowess of sf can bring new dimensions to our efforts: not only to resist things as they are, but imagine worlds a new.

A significant amount of sf directly registers the *entanglement* of food and fuel economies, and can be read in ways that help elucidate the contradictions such modes of production generate. I will begin, then, by considering one of the contemporary energy and food production's more infamous sites of overlap and contradiction: biofuels. Biofuels not only constitute a form of agricultural production emblematic of the deep social and ecological impacts of the CFR, but also offer numerous points of comparison with the hi-tech and often calamitous scenarios imagined in sf. This analysis is followed by a brief examination of the 'food sovereignty' movement, which can broadly be characterised by its opposition to agro-industrial capitalism for its prioritising of land for the production of (*inter alia*) energy and/or globally tradable commodities, rather than sustainable and equitable food production. The latter section of my discussion considers how sf has offered a continually shifting

exploration of these issues over the course of the neoliberal era. Some key texts, I argue, should be understood as presenting readings of, as well as interventions into, what advocates of food sovereignty call the 'agroecological turn' (Altieri, 1995; Redman, 2008). This, in opposition to the industrial project of the CFR, is rooted in the attempt to resituate food production within a context of social and ecological limits; limits that inevitably impinge on dominant energy regimes as they service present – and future – modes of production.

Biofuels and 'neo-nature'

As a form of fuel explicitly linked to both agricultural and energy production, biofuels mark out a crucial set of coordinates in the global 'food-water-energy nexus' (Smajgl et al., 2016). Though agricultural systems have always been linked to energy production (tallow, wood, dung, and other myriad agricultural products and by-products have long been burned as fuel), 'first generation' biofuels (i.e. crops explicitly grown for fuel production) belong to a mode of production that is extreme in its capacity to degrade ecosystems and deprive local peoples of their capacity to determine socially, culturally, and ecologically sustainable food production. For while biofuel production is expanding, available land for food production is steadily shrinking (World Bank, 2018). Biofuels now account for over two-fifths of US corn production, underwriting around 75% of the food price increases between 2002–2008 (Baines, 2015: 295). As such, biofuels represent, as Joseph Baines suggests, 'one of the most significant transformations in the world food system in recent decades' (Baines, 2015: 295), rapidly expanding to account for 14 million hectares of agricultural land use in less than 10 years. This situation looks set to continue, with production predicted to expand to 30 million hectares by 2030 (Cotula et al., 2008: 19).

At the same time, supporters of biofuels deploy a justificatory language of 'progress' and 'sustainability' (Oliveira and Hecht, 2016), now commonplace in the discourse of neoliberal capitalism (Harris, 2014). This combination of factors have led a number of commentators to describe biofuels as emblematic of the contemporary rhythms of world capital accumulation, especially regarding their functionality as a 'flex crop' (Borras & Franco, 2012). Such crops, McMichael (2016: 660)

explains, 'intensify] the fetishism of commodity agriculture by converting all crops to exchange value *par excellence*, where they serve alternately as food, feed, or fuel, depending on market and/or board-room conditions'. To their staunchest of critics, biofuels are part of a radical reorganising of the world, a 'neo nature' geared towards the 'use of land essentially as a substrate', on which to grow genetic 'assemblages' (Oliveira & Hecht, 2016: 253). The utopian portrayal of biofuels by the CFR has, according to some, foregrounded a form of triumphant techno-modernism, concealing evidence of biofuel production's toxic and undemocratic effects. Such practices have been instrumental, as Olivera and Hecht (2016: 255) suggest, in effecting the 'complete destruction of pre-existing natures, agrarian or otherwise'.

The food sovereignty movement (a term popularised by the peasant coalition, La Via Campesina in 1996) – emerged in direct response to the consolidation of the CFR (McMichael, 2015), and has, accordingly, had a lot to say about biofuels. The movement has decried the often-calamitous failures to integrate biofuel production either socially or ecologically. As François Houtard (2010: 1) puts it, biofuels mean, quite simply, 'big profits, ruined lives and ecological destruction'. Whereas biofuels fit well within an abstract globalism described by José Bové (2002) as 'food from nowhere', food sovereignty has strongly advocated resituating food and energy production, informed by a sense of the fragility and finitude of the planet (hence McMichael's simple counter-term of 'food from somewhere' [McMichael, 2002: 52]). Over and against the abstract economics of CFR, food sovereignty, as McMichael (2016: 249) suggests, 'conceptually reorders the world' to correct for the biospheric and social costs externalised by the CFR.

In addition to its critique of the specious logic and corrosive practices of the CFR, the food sovereignty movement has developed a framework for its 'agroecological' vision of food production. Formally developed at Nyéléni 2007, the six 'pillars'¹ of food sovereignty articulate a vision of a sustainable agriculture which also maximises

¹ A collective understanding of Food Sovereignty' outlines six 'pillars' to describe a sustainable agriculture as that which: 'Focuses on food for people'; 'Values food providers'; 'Localises food systems'; 'Puts control locally'; 'Builds knowledge and skills'; and 'Works with nature' (Nyéléni, 2007: 76).

the autonomy of small-scale food producers from corporate or transnational actors and institutions (Nyéléni, 2007; Wezel, 2009). In order to structure the readings that follow, I will focus on three key themes developed from these six pillars. Firstly, issues of *political power* – that is, the ways in which industrial food and energy production often results in the dispossession and disenfranchisement of communities close-by (especially food growers); secondly, issues of ecological and social *integration* – that is, the need for energy and food production to take full account of socio-ecological limits (or, as Marx [1990: 638] would put it, the capacities of 'the soil and the labourer'); and, finally, issues of *the speculative* – that is, the use of imaginative procedure to justify (or contest) the present deployment and future development of industrial food and fuel regimes.

The speculative, it must be noted, is the most complicated of the three; food sovereignty activists point both to the dangerous abstraction (i.e. unreal nature) of the CFR, while simultaneously deploying fictional, imaginary, or exaggerated elements – e.g. what McMichael (2016) refers to as 'concrete utopianism' – to structure and justify their own interventions. This dynamic, I argue, must be better understood, especially by those advocating the upscaling of small-scale agroecological practices. As McMichael suggests, 'the significance of the food sovereignty movement is that, in the narrative of capitalist modernity, its project is virtually *unthinkable*' (McMichael, 2008: 219, emphasis added). The language of food sovereignty advocates and activists is, unsurprisingly given the spatio-temporal scales involved, often very conceptual. Bove's 'food from nowhere' provides just one example of this tendency; indeed, the food sovereignty literature is littered with references to the 'unthinkable', 'illusory', and 'unreal' nature of industrialised food regimes, as well as the speculative and imaginative character of their opposition to it. In this sense, the food sovereignty movement demonstrates an affinity with literary conceits and theoretical concepts employed in sf writing and culture. These, I argue, must be further explored as a way to make challenging concepts in the existing scholarship on the food sovereignty movement more graspable, and the movement itself more inclusive. In the readings that follow I will retain the three ideas itemised above – *power*, *integration*, and *the*

fantastical – as a framework to highlight the key ways in which sf makes visible the complex, confusing and often intertwined worlds of contemporary agrarian resistance, and industrial fuel and food production.

SF and agriculture

In her pioneering essay on food and sf, Jean Retzinger states that:

When food moves from the periphery [. . .] to the center (becoming the locus of fear) in science fiction films, food represents the whole of a culture's entangled relationship with both nature and technology. (Retzinger, 2008: 383)

The same can be said of the relation between food and energy. In food systems of all kinds, energy issues are never that far away. And while food and energy will inevitably feature in narrative of all kinds, speculative fiction is particularly remarkable, because any convincing vision of credible or *incredible* futures necessarily involves a degree of *re-imagining* food and energy infrastructures. This is often done in ways which invariably point us back to the contingency of things as they are. Accordingly, the sf canon contains some deeply disquieting explorations of food and energy economies. In one of the best-known examples, Douglas Trumbull's 1972 film *Silent Running*, for example, a high-tech (i.e. 'post-nature') society sends biological specimens from Earth into space, in ark-like greenhouse domes, attached to freighter ships. When the order comes from Earth to redeploy the freighters for commercial use, and to destroy the domes and their cargo, the central protagonist, Freeman Lowell, refuses to comply. Lowell has already explicitly linked self-determined food production to political freedom: when asked why he likes eating fresh produce instead of the processed food his shipmates eat, he replies: 'The difference is that I grew it. That's what the difference is. That I picked it and I fixed it. And it has a taste and it has some color. And it has a smell. And it calls back a time when there were flowers all over the earth. . .' The decision to destroy the ships is understood by him as an oppressive act, consolidating corporate power at the expense not only of a common cultural and

biological inheritance, but also the radical power of memory and tradition iterated through agricultural practice.

Another sf movie of the same era, *Soylent Green* (dir. Richard Fleischer, 1973), similarly attempts to concretise an unjust operation of state or corporate bio-power. Its depiction of a mode of production based on the mass-euthanasia (and then processing-into-food) of humans makes literal a politics that elevates narrowly economic exigencies over human life. Through its depiction of high-level corruption and intolerable inequality, *Soylent Green* gives tangible form to the idea that it is not the lack of environmental and human resources that necessitates the 'necro-economy' of its imagined future, but rather the impact of a narrowly consumerist political vision. Another significant sf work from this crucial era of environmental awakening and equally sceptical of such consumerist modes of social organisation is Ursula Le Guin's *The Dispossessed* (2011 [1974]). Its two worlds, Urras and Anarres, are starkly opposed – the former has abundant resources, but extreme inequality; the latter has very few resources, but is organised to protect against any centralisation of power that might lead to their uneven appropriation. 'Decentralization', we are told, 'had been an essential element in [Anarres' founder's] plans [...] the natural limit to the size of a community lay in its dependence on its own immediate region for essential food and power' (Le Guin, 2011: 76). The result, in contrast to extreme degrees of inequality on Urras, is a resolutely democratic and human-centred food and energy regime, with a raised consciousness about limits and sustainability. On Anarres, 'Children were fed [...] Not very well, but enough. A community here can grow food. [...] Nobody starved here' (Le Guin, 2011: 256).

We might expect such prominent texts from a pivotal era of environmental awakening and world resource anxiety to yield productive examples of the food-energy nexus. Emerging out of the shadow of Rachel Carson's *Silent Spring* (largely considered to be year zero for the modern environmental movement [Lytle, 2007]) and the Great Acceleration (McNeill & Engelke, 2016), shifts to large-scale farming practices were made possible by massive increases in petroleum use; the optimism for which took a huge blow during the oil shocks of the following decade. At this

time, an uptick in the production of dystopias and 'critical utopias' (Moylan, 1986: 10) appears as a response to growing unease about the limitations of the planet's resources and potentially negative political and ecological ramifications (see, for example, Ziser's 'Oil Spills' [2011]). But sf texts aren't always as direct or earnest in their exploration of the political economy of food and energy production. Indeed, sometimes more 'unconscious' or oblique registrations reveal salient things about food and energy's complex entanglement. Often, it is the *absence* of agricultural production that is striking. Being able to materialise, synthesise or otherwise produce food *without* agriculture has long been a prominent trope in sf, ostensibly representing an emancipation from agricultural drudgery, its required labour and its natural temporality, or what Marx called the 'realm of necessity' (Marx, 1996: 571). More recently, this vision of an agriculture-less world has become increasingly associated with the Marxian theory of the 'metabolic rift', a term derived from Marx's description of the 'irreparable break in the coherence of social interchange prescribed by the natural laws of life' (Marx, 1996: 567). Capitalism has, as Marx puts it, an immanent contradiction relating to the capacities it demands, and that which can be supplied by 'labour and soil': 'All progress in capitalist agriculture', Marx suggests:

Is a progress in the art, not only of robbing the worker, but of robbing the soil; all progress in increasing the fertility of the soil for a given time is progress towards ruining the more long-lasting sources of that fertility. (Marx, 1990: 638)

As much as Marx's interest in 'capitalist agriculture' was located in the historical circumstances of 19th-century technological intensifications (Foster, 1949), so too do the texts examined here register a particular historical context of agricultural intensification. As Retzinger suggests (2008: 383), visions of high-tech agronomies now tend to bring us into the 'locus of fear' of food and energy production, drawing on a troubled unconscious stirred by the vague awareness of systemically flawed modes of production.

This ambivalent awareness can be seen in some contemporary sf texts. Two recent prominent examples are the Hollywood movie productions *Interstellar* (dir. Christopher Nolan, 2014) and *The Martian* (dir. Ridley Scott, 2015). In the former, though food production is far from absent, it is stridently disavowed by the film's central protagonist, Joseph Cooper, in favour of interstellar and inter-dimensional travel. Farming, by contrast is the object of some derision: 'We're explorers, not caretakers', Cooper tells us, a sentiment doggedly rooted in the powerful technoutopian ethic of limitless (and fossil-fuelled) expansionism. In *The Martian*, the disappearance of agriculture from the film's plotworld is much more obviously the result of unconscious processes. The marooned astronaut Mark Watney attempts to survive by growing potatoes propagated from the ship's rations. Watney hastily (and implausibly) creates a soil substrate from a mix of his own effluence and Martian 'dirt'. When the crop is destroyed by exposure to the harsh Martian climate, Watney is promptly rescued, leaving one to wonder about the point of his painstaking struggle. Whereas Watney's eventual rescue is partly attributable to boilerplate Hollywood survival story, it is interesting that food so easily disappears from its plot.

Both of these films indicate the extent to which their audiences (and wider cultural infrastructures) may have unconsciously assimilated the logic of a world content with its own widening 'metabolic rift': their plotlines run on the underlying notion that sustainable food production is clearly a massive but necessary challenge. Both films on one level at least ask questions about this, but they are all too easily swept aside by plot twists and genre demands, elements that tend to either underplay or ignore the significance of political economy as a crucial feature in their registration of future food regimes, 'sustainable' or otherwise. I want then, to pursue alternative examples – varying in form, genre, and publication date, but unified in their emergence at key junctures in the neoliberal era – that place food and energy production 'at the centre' of their plots, making explicit the political implications of their respective food and fuel economies. In the readings that follow I explore in greater depth how three sf works – *The Moon is a Harsh Mistress* (1966), *Survivors* (1975–7), and

The Windup Girl (2009) – comparatively engage with intersecting issues of food and energy's problematic entanglement.

The Moon is a Harsh Mistress (1966)

Robert Heinlein's *The Moon is a Harsh Mistress* (*TMHM*), tells the story of a moon colony, 'Luna', and its fractious relationship with Earth (or 'Terra'). The story begins just before an uprising on Luna against the colonial 'Authority'. The novel bears comparison with *The Dispossessed*; indeed, as Donna Williams suggests there have 'rarely been two books so closely related, so superficially similar, and so different in thrust' (Williams, 1994: 164). As Williams explains, in contrast to Le Guin's anarcho-syndicalism, Heinlein has been routinely associated with an overtly Libertarian (even Randian) politics – *TMHM* is indeed markedly masculinist, militarist, and staunchly individualist in tone. 'For Le Guin', Williams continues, 'it is individual responsibility that makes true community possible. For Heinlein, it is the impossibility of community that makes self-responsibility necessary' (Williams, 1994: 167).

While Le Guin and Heinlein famously espoused contrasting political stances, the worlds they imagine nonetheless possess some striking commonalities beyond the merely superficial. Both tell a story of resistance based on a keen understanding of the simple arithmetic of agroecology, not only considering the sustainability of food production, but also cognisant of crucial aspects of their colony's cultural and political life. Both texts also demonstrate what happens when energy and food production move to the centre of sf works, representing 'the whole of a culture's entangled relationship with both nature and technology', as well as the kinds of resistance which such a situation generates (which I explore below).

As in *The Dispossessed*, many of *TMHM*'s protagonists demonstrate an acute awareness of the operation of geopolitical and commercial power through food, mineral and energy production. In Le Guin's novel, Anarres is perceived by Urras as its mining colony. *TMHM* pays specific attention to the imbalances which emerge through a '(neo)colonial' model of food production; i.e. where food production in a peripheral location is determined externally by (and for) a hegemonic centre (see Niblett [2012]). *TMHM* has, accordingly, a heightened sensitivity to notions of

sovereignty, food or otherwise. The origin of the uprising against 'the Authority' is rooted in grievances over the exploitative conditions imposed on Luna farmers: 'Authority isn't passing along that low price to farmers [. . .] I have to buy water from Authority – and have to sell my wheat to Authority – and never close gap [sic]' (Heinlein, 1979: 20).

Though conditions on Luna pre-uprising are simply not sustainable, hopes for independence are widely held to be unrealistic 'nonsense' (*TMHM*, 35). Indeed, one of the key challenges for those advocating resistance is purely conceptual – that is, to make visible the insanity of the prevalent colonial model and the viability (not to mention, justice) in independence. We hear, for example, that farmers who plant 'cash crop[s]' end up with a 'ring in [their] nose', and that 'If [one] wanted to be independent [s/he] would have diversified. Raised what [s/he] eats, sold rest [sic] free market and stayed away from catapult head' (*TMHM*, 35). More than anything else, it is deep-running structural conditions which keep the Luna farmers locked into such unsustainable dependency pathways.

TMHM is at times remarkably prescient in its use of language that has since become typical in contemporary food discourses, referring not only to 'cash crops', but also extensively to 'sovereignty' (a term which only began to gain currency within agrarian movements in the mid-1990s [Desmarais, 2007: 32]). Terra's power over the colony is shown to be based on patently arbitrary and insubstantial claims to cosmic power. As Terrans see it, 'Earth's major satellite, the Moon, is by nature's law forever the joint property of all the peoples of Earth. It does not belong to that handful who by accident of history happen to live there' (*TMHM*, 201). When, in response, the Luna delegation attempt to invoke their sovereignty, the Terran rebuttal is simple: 'Sovereignty is an abstract concept, one that has been redefined many times as mankind has learned to live in peace. We need not discuss it' (*TMHM*, 203). The Luna delegates' response amounts to a powerful rejection of this idea, situating sovereignty instead in the lived experience of the lunar colony: 'The sovereignty of Free Luna is not the abstract matter you seem to feel it is. These commitments you speak of were the Authority contracting with itself' (*TMHM*, 203).

Luna's claim to sovereignty directly contests the Terrans' abstract appeal to a market economy, towards the more concretely situated needs of the Luna colony; that is, towards a politics rooted in place, and the valorisation of the simple premise that 'food belongs to hungry [sic]' (*TMHM*, 223). Luna's need to produce food for their people and within the limits of their planet – in other words, their *situatedness* – is used to contest the 'taken-for-granted' superiority of Terra over its moon colony. There is, moreover, an ergo-political realisation: not only does Luna refuse to comply with Terra's exploitative demands, but it also discovers a previously unnoticed advantage. The moon has 'energy of position; she sits at top [sic] of gravity well eleven kilometers per second deep and kept from falling in by curb only two and a half km/s high' (*TMHM*, 87). Luna's awakening as a sovereign nation thus exposes the hidden fragility of Terra's (and, indeed, the contemporary) paradigm of outsourcing food and energy production to the colonies: dependency.

Just as food is prominent in *TMHM*, so is energy. In short, energy has a subtle though consistent presence throughout the novel: Luna has long ago developed a substantive awareness of the embeddedness of energy production in food systems. Its farms are planned not only by 'area' but by 'cubic' metres (*TMHM*, 198), comprising vast networks of sealed tunnels and tight control of its scarce resource inputs. Though a small portion of Luna's power supply is generated directly on Luna itself – 'We collect some power, sunshine screens on surface, and have a little pocket of ice' (*TMHM*, 35) – Luna's real source of energy comes from its soil. Luna is, we are told, 'one enormous fallow farm, four thousand million hectares, waiting to be plowed!' (*TMHM*, 209). While a distinctively extractivist attitude is visible here, elsewhere Luna's revolutionary protagonists exhibit a heightened ecological awareness of their soil's finitude, as well as the risk posed by Terra's colonial model to Luna's social and natural ecology. In one instance, the process of agricultural extraction is set up in bodily terms:

"Terra condemns your grandchildren to slow death. The miracle of photosynthesis, the plant-and-animal cycle, is a closed cycle. You have opened it – and your lifeblood runs downhill to Terra. You don't need higher prices, one

cannot eat money! What you need, what we all need, is an end to this loss".

(*TMHM*, 25–6)

Luna's agronomy will only work – and we are repeatedly reminded of this – if its ecological inputs and outputs are balanced; indeed, the delegates to Terra make this explicit, urging the Terrans to '[s]end us briny sea water, rotten fish, dead animals, city sewage, cow manure, offal of any sort – and we will send it back, tonne for tonne as golden grain' (*TMHM*, 209). Crucially, Luna also invite Terran's 'poor' and 'dispossessed [. . .] by thousands and hundreds of thousands' as a means to *socially* (as well as ecologically) replenish their revolutionary life-blood. Given sovereignty over its people, its food production and its borders, Luna's model of self-governance promises long-term sustainability and mutual prosperity.

TMHM's sensitivity to the political and ecological vulnerabilities of its food systems is largely a result of where it sits in the genealogy of neoliberalism. The time of its publication, only shortly appearing in print after Rachel Carson's *Silent Spring* (1962), coincided with an important phase of the industrialisation of the global food system: the so-called 'Green Revolution'. This, as Carson's famous text also attested, heralded a wave of opposition not only to the toxic impacts of industrialisation, but also their political ramifications. In 1967 The Environmental Defense Fund was founded, and a few years later (in 1970) a US government department, The Environmental Protection Agency, also emerged. These two organisations became emblematic of a joint grassroots and institutional response to the environmental degradation caused by industrialisation, generally, and thus broadly characterise the neoliberal period as a whole.

Like Carson's *Silent Spring*, and its 'Fable for Tomorrow' opening, it is *TMHM*'s speculative frame that gives the text its real power, focalising the disorientating effects of living at the 'production end' of an industrial or neo-colonial food system. As Niblett suggests, 'the imposition of cash-crop monocultures [. . .] reorganize[s] and defamiliarize[s] the existing socio-ecological unity' (Niblett, 2012: 23). In literatures from areas of the world disproportionately affected by the expansion of industrial food production, continues Niblett, the 'use of elements of the schizophrenic, the

delirious, and the fantastical' are commonplace, registering 'the unreal quality of a reality thoroughly imprinted by external forces' (Ibid.). While technically distinct from the magical-real strategies employed in the texts Niblett describes, the same general disorienting and estranging effect can be seen in *TMHM*. Take, for example, *TMHM*'s planet-moon plot premise: though far longer than any real-world supply chain, the distance between *TMHM*'s two 'worlds' exaggerates the absurdity of *any* food system predicated on the shipping of huge quantities of embedded energy across vast distances, especially if the energy transfer is only one way. As in Bové's idea of 'food from nowhere', Luna's struggle concretises the fatal unsustainability of capitalism's infamous tendency to 'externalise' costs (Martínez-Alier, 2002). In order to gain legitimacy, the proprietors of such food regimes must also conceal their true social and ecological impacts; that is, purport to produce food that appears quite literally 'from nowhere' in the hope that eventual consumers won't notice its problematic origins. Interestingly, even in Luna where the madness of such an interplanetary operation might seem obvious, the political agitators' description of their 'lifeblood run[ning] downhill to Terra' makes graspable to Luna citizens what must be obvious to any reader. Like many participants in contemporary food systems, Luna citizens also use imaginative procedure to visualise the absurd dimensions of their own calamity.

In offering a producer-perspective, *TMHM* draws on a history of agrarian resistance which has sought to demonstrate 'that we are all, without exception still "enchanted", imprisoned, deformed and schizophrenic in [the market economy's] bewitched reality' (Wynter, 1971: 96). Such a strategy is, as Michael Taussig suggests, a common feature of writing rooted in peasant cultures, who encounter capitalism as 'a magico-religious world [. . .] consecrated in rituals' which 'turn plantation crops like sugarcane into monsters or gods' (Taussig, 2010: 122). *TMHM* enacts a similar conceit; over and against Terra's fantastical neo-colonial project, Luna offers a much more situated – one might say 'realistic' – account of its social and ecological rationale for local determination of food production. This is reducible to disarmingly simple tenets: firstly, that 'food is for the hungry' (anticipating, for instance, the 'right

to food' debate [UN, 1976]); secondly, in Luna's glib-sounding but ecologically robust motto of 'There is no such thing as a free lunch' (shortened to 'TNSTAAFL'), anticipating the fourth 'law of ecology' famously outlined by the biologist, Barry Commoner (1972). Whatever *TMHM*'s protagonists' ideological leanings (or, indeed Heinlein's own), Luna draws on a straightforwardly *situated* politics in order to resist the fantastical and unreal demands of a colonial and exploitative agricultural regime.

Survivors (1975–77)

Survivors (1975–77), is a UK television series depicting the immediate aftermath of a global, man-made epidemic. I've chosen this BBC series as a comparative text here as it sits astride another crucial juncture in the development of the CFR: namely, the mid-1970s oil shocks and increasing fears about the limits of late capitalism to guarantee its own energy supply. Encapsulating both the productive disruption and the (later) paralysing fear that such events precipitated, *Survivors'* plot revolves around a core set of protagonists as they navigate the aftermath, moving from settlement to settlement before making several attempts to establish their own community. *Survivors* is a solicitous and somewhat overlooked work, offering percipient insights: not only into the political dynamics current at the time, but also the complex and often confounding entanglement of food and fuel production.

Survivors consistently brings to the fore the political implications of decisions made at community-level pertaining to food and energy production. After an episode detailing the exact mechanism of the epidemic, the series begins to explore the repercussions of its post-apocalypse. One of the central protagonists, Abby, initially declares that she is content to survive on the 'stockpiles' of food and energy leftover from the 'old world'; however, she is soon challenged on the long-term viability of this strategy, as well as its wider ramifications:

"That would be simply scavenging, wouldn't it? And a constantly diminishing supply. What is important is learning again. Things you've never even needed to consider before. [. . .] A book will tell you how electricity is generated, but could you do it, right from the very beginning? Find the metal

in the earth, dig it up, refine it, turn it into wire? Could you make and cast glass for a light-bulb? You'll need to know every part of every process [. . .] We must learn". (S1:E1)

The declaration is of paramount importance to the series as a whole, establishing not only a long-running commentary on the dependency built into contemporary modes of production, but also a preoccupation with the significance of self-determined production. Questions of political power and democratic governance repeatedly cluster around such decisions; especially pertaining to energy generation, and the impacts and entanglements they subsequently have on food production. At one juncture, Greg (another central protagonist) devises a means to generate methane from animal manure – literally a primitive form of biofuel. However, to produce the fuel in large enough quantities would, we are told, mean 'a whole revision of our farming system'; namely, growing food to feed animals rather than humans, and keeping livestock in barns so their manure could be more easily gathered. The episode (S2:E11) precipitates a power contest – on one side, Carter, who advocates a supposedly 'practical' approach, urging the community to 'stop playing at it and start farming', and that 'to farm properly you've gotta have power [it's] a matter of simple priorities'. In opposition to this technological pragmatism, Carter's critics dismiss his plan as 'factory farming', emphasising their 'concern for us as people'. The implementation of such a project, they claim, would mean '[the community's] sweat and toil'. Though some form of methane generation does go ahead, the community significantly decides to reject Carter and his 'industrial' farming system.

The community's way of doing things is never perfect, of course – in fact, it is precisely its internal tensions which help to elucidate the political importance of food and energy production amidst the conditions of scarcity and environmental crisis. *Survivors* maximises this dynamic in its representation of inter-community contact. Perhaps the most important example of this occurs during the 'Lights of London' episodes (S2:E9;E10), which act as a reminder of the insidiously coercive forces certain forms of production entail. In return for home comforts like electric lights and a cinema, the London settlement appears to have traded away basic civil

liberties. 'We're well looked after', Greg and Charles are told, ominously, though the inhabitants live with the daily reality of giant rats, authoritarianism, and degenerative illness. When we return to the community in the following episode it is hard not to view London as some kind of nightmarish flashback; indeed, in a logic common to sf, whilst *Survivors* is ostensibly a foretelling, we are clearly invited to link these scenes to the grim social relations and economic conditions of contemporary 1970s Britain.

Like *TMHM*, *Survivors* demonstrates an acute awareness that decisions about how and what to produce need to be socially and ecologically integrated. After several early experiments, Paul (a farmer) advocates a decidedly agroecological approach, declaring 'you've gotta become part of it' (S1:E8). This approach comes to be instrumental in the decision to reject certain forms of production – such as those using complex machines, like tractors – on the grounds that 'we never become dependent upon anything that can't ultimately be replaced by making it ourselves' (S2:E11). Because they are more easily integrated in their food-energy nexus, horses are opted for instead of motor vehicles. As Charles puts it, 'our plan of survival is geared to self-sufficiency' (S2:E11), establishing a neat integration of practical and political logic.

Survivors makes it clear that to do anything else – again much like *THMH* – would be to exist in the realm of fantasy. Typical of post-apocalyptic sf, *Survivors* gives us the opportunity to recognise the madness of the previous system, particularly its agro-industrial elements. 'There wasn't a day in your life', one character remarks, 'when you didn't eat something that was an imported food' (S1:E12). Again, the strategy here seems to be to turn conventional norms upside down, revealing their illusory qualities. Pre-epidemic civilisation, as Charles describes it, is seen now as a 'vast support system to ease the pain' (S2:E2). The kind of production regime implemented by the survivors is, in contrast to this, a much more situated one. The food they grow and eat is 'from somewhere' – literally from the fields surrounding their settlement – rather than 'nowhere'. There are those in *Survivors* who quixotically hope to rely on dwindling stockpiles, which take on a deathly, haunted quality: when Paul is forced to enter a local town in search of supplies, for example, he returns infected with a

mutated form of the virus and dies. To salvage becomes quite literally to enter the world of the dead. In episode 10, the survivors meet the leader of a salvage operation, trading luxury items for gold. The traders' approach is remarkable for its patently absurd valorisation of the old world's tokens. Their eventual defeat fits within the series' long meditation on the urgent need to reconceptualise our relationship with the land and each other.

While the first and second series of *Survivors* offer an earnest exploration of the material and social relations productive of a more sustainable and equitable food and energy system, by the third series this focus begins to shift. After meeting a fellow survivor intent on getting 'industry back on line' (S2:E12), series three opens to find the community besieged and depleted, with Greg having left in the hope of restoring the UK national power supply. As Charles describes it, Greg has succumbed to 'chasing after myths [of] progress' (S3:E4). Worn down by their increasingly precarious existence, the dream of a situated and equitable society has all but evaporated among the survivors. 'What good is a farm these days?!', one character declares, 'It's a jungle out there' (S3:E3). As ever, *Survivors* presents these forces in delicate tension; there are compelling reasons to want cheap electricity supply – 'think what electricity means', one parent declares (S3:E12). Indeed, for those raising children, electricity means modernity: electric lights, sanitation, washing machines. In the end, Charles' attempts to get everyone back to the farm, while still framed in terms of sovereignty, lack their original vitality, and prove ultimately ineffectual.

By episode 5, the pursuit of industrial electricity generation has unquestionably become the community's chief priority, with even Charles rhapsodically declaring that there's 'coal waiting to be spooned out of the ground' (S3:E5) – the mere fact of its existence appears to be reason enough to go and find it. This is in marked contrast to the focus on self-determined production which emerged in early episodes of the first series. Charles' plan to 'spoon' coal out of the ground acts as a darkly ironic reminder of that initial conversation in which Abby was asked, 'could you [generate electricity], right from the very beginning? Find the metal in the earth, dig it up, refine it. . .?' (S1:E1). To the extent that he wishes to *spoon the coal out of the*

ground, Charles' newly discovered appetite for fossil fuels both literally and metaphorically suggests his prioritising of industrial energy production over and above food sovereignty.

Though the description of Charles as 'a mad capitalist tearaway' in episode 7 is laughed off by himself and other characters, the willingness to sacrifice everything for a return to large-scale power generation is hard to reconcile with the foundational – and food-focused – aims of the settlement. Whilst Greg bitterly regrets his decision to leave the community (just before he dies), in the end it is only the clearly deranged Sam Mead (who attempts to sabotage the plan to switch on a hydro-electric plant), who seems to be aware of the political implications of this shift in priorities. 'People have become self-sufficient', he declares, 'give them electricity [. . .] they become slaves' (S3:E12). As power is brought back online and the series ends, we are left with the disquieting scene of a Scottish Laird sitting down to a lavish dinner in his castle, only too happy to revive the social and material relations of inequality on which his Lairdship is based. We could be tempted to understand such a resolution, as Carl Freedman might say, as a means to 'foreground and demystify the actual' (Freedman qtd in Latham, 2014: 2); that is, as some precautionary comment on real-world conditions. However, *Survivor's* conclusion is undeniably troubling and a far cry from the political optimism of the show's first two seasons.

Survivors' periodicity is worth mentioning again here. Conceived around the time of the first oil shocks and growing fears about the limits of supply, *Survivors* emerged in a period of heightened discussion about the possibilities of reorganising society. As *Survivors* enters its third series, these fears have demonstrably developed a darker, more jaded edge, producing a largely circumspect outlook on the plausibility of creating a sustainable and equitable society. When *Survivors* was resurrected in 2008 (2008–10) this sense of diminished possibility was even more pronounced, especially when seen from the perspective of food and energy. While it can't be said that the 'rebooted' *Survivors* is entirely *unpolitical*, significant aspects have been jettisoned, not least the self-determination that characterises the original series' portrayal of food and energy production, as well as the systems of democratic

governance which are needed to successfully direct this. While I do not have space here to delve any further into *Survivors'* ill-fated follow up, it does register another signal moment in the development (or perhaps eventual decline?) of the late capitalist world system; that is, the financial crash of 2007/8. The next section moves to consider a novel published immediately after this event.

The Windup Girl (2009)

Paolo Bacigalupi's *The Windup Girl (TWG)* is a 'biopunk' novel set in 23rd-century Thailand. The world depicted is in the advanced stages of global warming: sea levels have risen, fossil fuel reserves are all but exhausted, and the global food supply is on the verge of collapse. The 'natural' seed stock has been almost entirely replaced by 'gene-hacked' varieties, controlled by a handful of mega-corporations. With genetic variation at a critical minimum, 'superbugs' are common, often wreaking havoc with what food crops remain, and in some cases infecting humans as well. The story is told from the perspective of Anderson Lake, an economic spy and saboteur working for 'AgriGen', one of the few corporations dominating both the world's food system and its energy markets. Anderson owns a power plant which generates and stores electricity by winding huge 'kink-springs'. The factory is just a cover, however, for Anderson's real mission to locate (and plunder) a secret seed bank of the world's original natural seed-stock. When Anderson meets Emiko, an illegal Japanese 'windup' (i.e. android) girl, he sets about using her as a way of finding the seed bank and plundering its vital genetic diversity.

TWG is clearly motivated by a suspicion of contemporary corporate politics, as well as environmental fears associated with industrial agriculture. In this context, we might expect *TWG* to play heavily on contemporary fears that energy extraction – 'flex-crops' like soy or palm as much as fossil fuels – often displaces land used for food grown directly for human consumption. Olivera and Hecht (2016: 252) note that 'less than six percent of all soy produced in the world is consumed directly as human food' – the rest being redirected to produce biofuel or animal feed. *TWG's* entangled food and fuel economies presents a similarly bewildering contradiction. Though fossil fuels feature in the novel, they do so in a very distinctive way: ostensibly

a post-fossil fuel society, the history of fossil fuel production remains visible not only in *TWG's* polluted landscapes, but also in the cultural sensibility of its world's inhabitants. The narrative takes place during the final stages of a period of conflict and turbulence referred to by some as the 'coal war', though its exact parameters remain deliberately vague. In any case, coal (along with other forms of fuel) is a source of constant anxiety for *TWG's* characters, who remain acutely aware of its scarcity and often buy it (and other forms of state-controlled fuel) on the black market. As a result, fuel (and fossil fuels specifically) possesses a distinctly fantastical quality: these are commodities which cannot be talked about openly, or seen directly, but which nonetheless continue to exert powerful influence over everyone involved. Coal, as one character points out, is 'astonishingly dirty and terrible for carbon limits, but almost magically powerful' (*TWG*, 269).

Complementing *TWG's* meditation on the fetishized persistence of fossil fuels is a compelling reproduction of the convoluted logic and unequal power relations of intertwined food and fuel economies. The world is irresistibly in the grip of huge transnational corporations, who control the entire genetic plant stock. Resistance is conceived almost exclusively in terms of opposition to them, in ways which attempt to refocus conventional logic away from the inevitability of their rapacious accumulation regimes and back to the simple logic of feeding people equitably: 'How will we ever overcome the AgriGens and PurCals of the world', asks one character, 'if we don't feed our friends?' (*TWG*, 82). It is a monumental task; indeed, Anderson's power plant embodies the twisted logic which drives such toxic regimes. At one point, he reiterates the justification for growing the gene-hacked algae crucial to the spring manufacturing process: 'Forget its calorie potential. Focus on the industrial applications' (*TWG*, 9). Not only is energy (rather than food) the priority here, but specifically the capacity to guarantee and centralise profit generation: 'I can deliver the entire energy storage market to you', his associate tells him, 'if you'll just give me a little more time' (*TWG*, 9).

As well as commenting on the distorting effects of the profit-motive, *TWG* also reproduces a perplexing entanglement of food and energy production reflective of

contemporary systems. The kink-springs are the main power storage devices, wound by huge 'genehacked' elephants called 'megodonts'. These animals, we are told, 'comprise the living heart of the factory's drive system, providing energy for conveyor lines and venting fans and manufacturing machinery' (*TWG*, 9). The megodonts are managed by 'handlers' who drive 'the elephant-derived animals to greater labor' (*TWG*, 9). The conceit neatly reproduces an energy future reminiscent of forms of 'combined and uneven development', viewed as central to capitalist development paradigms (Harvey, 2006; Löwy, 1981; Smith, 2010). In this sense it is also typical of the 'biopunk' genre, which is often concerned with the destabilising changes and inequality caused (or exacerbated) by biotechnology (Taylor, 2001). As a 'biopunk' text, *TWG* develops an aesthetic which is part antiquated and part hyper-futuristic. In doing so it reproduces a situation often hidden in the contemporary energy mix, one which looks on the surface to be about efficiency and transparency – such as we see in food or energy security discourses – but ultimately ensures and reproduces the inequality and comparative advantage enjoyed by those creaming off the profit.

Far from really being about 'feeding a starving nation' (*TWG*, 68), *TWG*'s food-energy regime is deeply confounding, especially in a food-scarce world. Indeed, those in charge of *TWG*'s world seem to revel in its extreme inefficiency: first, energy is expended growing food to feed elephants; these elephants then exert huge amounts of energy winding up the kink springs; and, finally, energy is also invested in the cultivation of algae, which are used in order to provide 'exponential improvements in torque absorption' (*TWG*, 9). Though this tangled mess is clearly part of *TWG*'s speculative apparatus, it is through such conceits that commonalities can be identified with our own food and fuel economies. The role of the megodonts, for example, clearly reflects the now widely acknowledged inefficiency in diverting huge quantities of grain – around 40% of the total world's supply – to feed livestock (CIWF, 2009: 5). As with our own world, this illogic is difficult to see – hidden behind the cultural acceptability (and, indeed, the profitability) of its own forms of animal use.

During an online Q&A session, Bacigalupi was asked about the illogicality of *TWG*'s energy economy: 'If they can make New People and cheshires' the online

questioner suggested, 'why can't they do the (relatively) simple trick of making algae produce oil?' Bacigalupi replied that '[a]t root, there was an aesthetic I was interested in, and I did everything I could to reinforce that. If you look at it through the lens of predictive science fiction, this story will definitely fail for you' (Bacigalupi, 2010). Bacigalupi's reply signals his interest in a particular approach to sf: namely an attempt to divert thinking about the novel away from the hard logic of 'predictive science fiction' to sf's capacity to bring us into an encounter with everyday illusions and irrationalities. The result is that we consider the ways in which *TWG's* energy regime *doesn't work*, or rather, who it *does work for*. As one character reflects, 'the AgriGens and PurCals who claimed that they were happy to feed the world, to export their patented grains, [. . .] always found a way to delay' (*TWG*, 201).

Bacigalupi's 'aesthetic', I wish to suggest, is the lived experience of a 'neo-nature', or of continuing to be seduced by the promises of 'food from nowhere'. From *TWG's* opening pages, we are confronted with the alienating effects of the narrative's high-tech food regime. Anderson investigates a mysterious new fruit which has appeared at the local market. The fruit's existence deeply troubles him, and, as he investigates further, his language strongly reflects the object's fantastical significance: 'It's more like a gaudy sea anemone or a furry puffer fish than a fruit. Coarse green tendrils protrude from all sides, tickling his palm' (*TWG*, 3). Anderson's reaction to the fruit is striking; not only does he note its otherworldly features, but also that 'it shouldn't exist' (*TWG*, 3). Far from being the otherworldly object it appears, we learn eventually that the '*Ngaw*' fruit is of non-genehacked (i.e. 'natural') origin – a miracle in the context of the corporate control and low-diversity of current seed stock. In doing so, *TWG* cleverly inverts the experience of the 'irreal' normally associated with biotechnology. *TWG* thus sets the scene of a world in which the corporate control of food – along with its disenfranchising effects – have become utterly normalised; in this context, the alternative – an ecologically situated and democratically-determined food system – appears truly inconceivable.

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All of the texts I have examined in this article offer a means to consider the formidable challenge of resisting the CFR. It is clear that the genres of sf and fantasy offer an as yet largely unopened repository of texts that might help us reimagine the food-fuel relation amid the contentious and unfolding debates about the future of the food-energy nexus. From an agroecological viewpoint, these and other texts might be read with this fundamental question in mind: what is the significance of these observations in the ongoing struggle for a fairer and more sustainable food system? All the works examined above register the powerful forces that act on the most vulnerable stakeholders in contemporary food systems. As such, they offer the means to consider the incredible scale of the CFR's toxic and rarely acknowledged contradictions. In short, they indicate how hard it is to resist the inertial and bewitching forces of neoliberal food-capitalism which continues to reproduce itself year-on-year with greater reach and power. No group is more aware of this than small-scale agroecological producers who, indeed, regularly draw on speculative and imaginative procedures to frame and understand their opposition to the forces of industrial agriculture.

Biofuels provide a particularly extreme example of the way such forces operate in the world today, concealing toxic, tangled and inefficient forms of extractivism operating behind a rhetoric of progress and sustainability. Despite the growth and destructiveness of biofuels and the CFR generally, however, agroecology is emerging as a global science, social movement, and set of practices increasingly recognised, not only by grassroots organisations (Nyéléni, 2015), but also by scientists (IPES, 2016) and policy makers (FAO, 2015). Attempts to advance the principles of food sovereignty would be strengthened, however, by greater consideration of the enchanting and fantastical effects of capital, which work to undermine attempts to shape a fairer and more sustainable food system. Fantastical genres help extrapolate and defamiliarise such enchantments, most notably in their speculative rendering of the extreme environments of the agricultural imaginary to come if we persist with the world-system of the CFR.

Future research might work to operationalise the bringing together of cultural theory and critical food studies. One promising avenue is critical food system education (Meek & Tarlau, 2016). The long history of popular education in Latin American agrarian movements (Martínez-Torres & Rosset, 2014) and evidence of a related and emergent network in Europe (Anderson et al., forthcoming) offers an obvious place to begin. In such a context, the use of 'collective readings', visioning exercises, and 'participatory theatre' might be used to explore the impact of the CFR and options for resisting it via sf imaginaries (McCune & Sanchez, 2018; Maughan et al., 2018). Grappling with the contemporary food system – where, as we have seen, food can easily appear like it comes 'from nowhere' – demands narrative frames and modes of representation which are commensurate with its depoliticising and disorienting complexity. Sf offers just such a set of tools to begin reclaiming the knowledge and control of food systems for those who produce and eat food, rather than those who simply get rich from it at the expense of all else.

Competing Interests

The author has no competing interests to declare.

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