Frontiers of Commodification and Historical Capitalism

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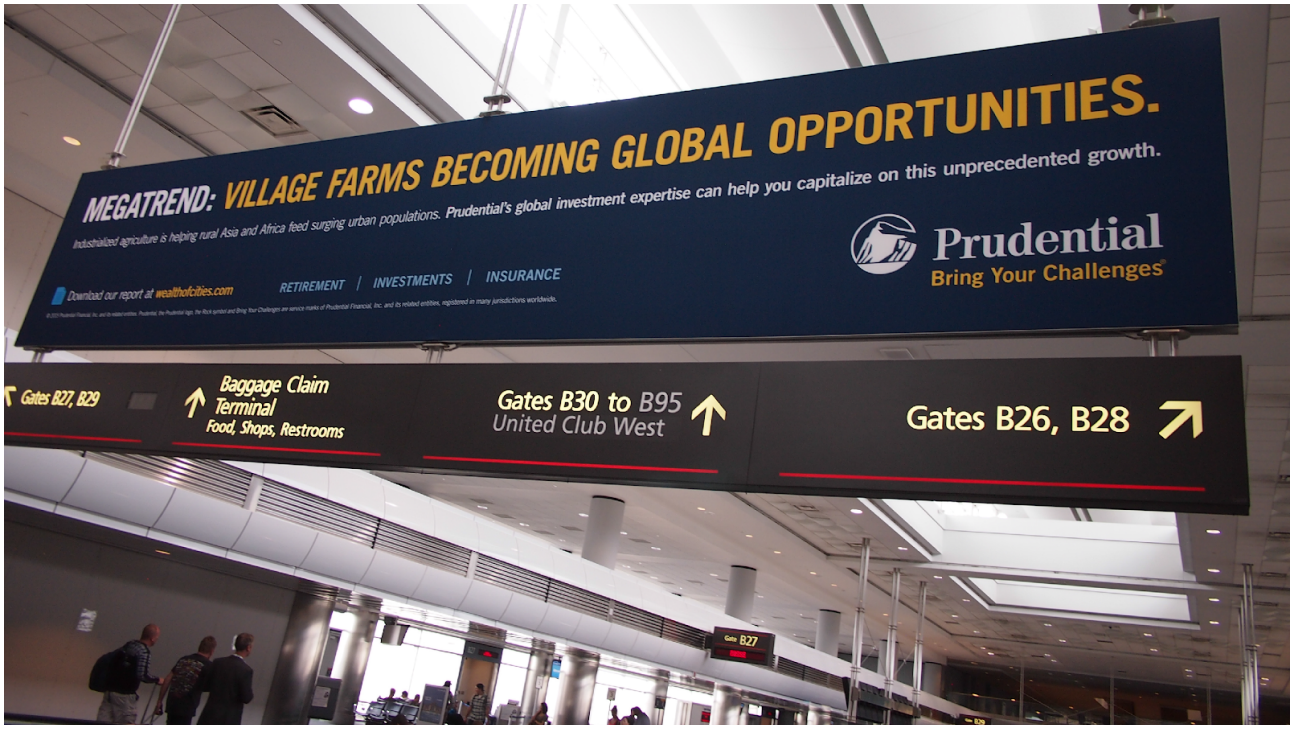
Abstract: Commodity frontiers embody global-scale power transitions, grounded in place-based frictions. These historic processes of countryside remaking involve commodification and local socio-ecological dialectics, addressed here through a (suggested) lens of "ontological encounters."



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Editor's Note: On December 9, 2021, Philip McMichael was part of a virtual roundtable to discuss the CFI research agenda. In this special contribution, he extends the commentary he offered during the roundtable. We are grateful for his careful and critical engagement. - MLS

Overview

'Commodity frontiers and the transformation of the global countryside: a research agenda' is an ambitious attempt at path-breaking interdisciplinarity in combining and ordering so-called 'fringes' of capitalist expansion. In this section, I offer comments and questions of clarification regarding the authors' turns of phrase in replying to their interlocutors (Beckert et al. 2021).

Focusing on the 'history of the making of the modern world' suggests more than, for example, 'global history,' since they wish to 'speak to the present.' The latter suggests an overriding *analytical purpose* in this project – one seeking to 'gain perspective on contemporary dilemmas,' summarized as 'our current socioecological predicament.' The perspective is clearly historical, and insofar as the countryside (as 'regions of extraction') is the focus the analytical framework might best be framed as *historicization* of the countryside. This approach animates three particular dimensions: (1) distinguishing the project from conventional empirical history – thereby encouraging the intended interdisciplinary dialogue; (2) promoting a relational world-historical sensibility as key to the authors' objective of historicizing the present – since the present *embodies* a certain history; and (3) understanding historicization of the countryside as a cumulative but contentious ecological reductionism, expressed in urban disdain for rural culture - in consequence of the 'metabolic rift' writ large[1]. This is consistent with the authors' terming commodity frontiers as 'fringes' of modernity. It also confirms/enables an epistemic approach restoring, rather than erasing, the socio-ecological value of rural life-worlds, as expressed, or at least evident, in the contested processes of annexation of particular 'frontiers' (cf, Escobar 2008).

The conceptualization of commodity frontiers as 'fringes:' not just places but relational processes, is an important perspective – not only because it speaks to this urban/rural divide, but also because it sets up the distinction between 'commodity frontiers' as *units of observation* of 'commodity regimes' as *units of analysis*. A question here concerns establishing a 'unity of the diverse' commodity frontiers for distinctive 'patterning' of commodity regimes? The authors suggest such patterning signifies moments of transcendence of socio-ecological limits to capitalist expansion with techno-political substitutions (as fixes): of slave- by indentured-labour, wood by coal, manual labour by machinery, and so on. These of course are re-orienting shifts in the broad sweep of capitalism, but they are not necessarily globally contemporaneous[2]. This is where international power relations become significant, in enforcing 'unity of the diverse' across quite uneven colonial empires – exemplified by Britain's mid-nineteenth enforcement of 'free trade imperialism' on recalcitrant states, via military[3] and/or economic[4] power. 'Patterning' also suggests, of course, hegemonic orders – as in Giovanni Arrighi's formulation:

> A dominant state exercises a hegemonic function if it leads the system of states in a desired direction and, in so doing, is perceived as pursuing a universal interest. It is this kind of leadership that makes the dominant state hegemonic. But a dominant state may lead also in the sense that it draws other states into its path of development (1990, 367).

While this quote is essentially for illustration, it does raise the question of the dimensions of regime power, where 'commodity regimes' coincide with (or even straddle) geo-political regimes. And their defining power relations vary with empires, state systems, military force, certain property relations, imperialism, *Haute Finance*, foreign aid, value chains, future foreclosure via commodification and/or digitalization, reinforced with ontological power via inevitability -- licensing enclosure and erasure of 'foreign' life-worlds and resilient practices.

It is noteworthy that the authors refer to fixes centered on country-sides for extra-urban 'resource' extraction -- not only to emphasize the significance of landscapes, but also to highlight how various 'fixes' prefigure socio-ecological disruption on a broadening scale. And it is important here to sequence these moments as reinforcing a historic cumulation of the metabolic and 'epistemic' rift

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[1] Cf Ajl (2014).

[2] For example, from the 18th to the 19th century, the American cotton commodity frontier straddled two distinctive conjunctures/fixes identified by the authors: slave labour, and wage labour, systems – where the C18th slave-holding Tidewater aristocracy coexisted with a mobile plantation frontier in the early to mid-C19th as industrialism and the City of London's new discount market financed a shift "from a family institution to an industrial system" (Dubois 1969, 152). Cf, McMichael (1991) and Tomich (1994).

[3] Gillo Pontecorvo's film, *Burn*, captures such 'patterning.' https://www.imdb.com/title/tt0064866/.

[4] Amitav Ghosh's novel, *River of Smoke* is a dramatic depiction of the cynical exercise of British power in this geo-political moment in orchestrating the opium trade between India and China.

(Schneider and McMichael 2010). Resulting soil exhaustion as territorial farming cultures are displaced alongside rising carbon emissions constitute the temporality of today, as characterized by Andreas Malm:

> For every year global warming continues and temperatures soar higher, living conditions on earth will be determined more intensely by the emissions of yore, so that the grip of yesteryear on today intensifies – or, put differently, the causal power of the past inexorably rises, all the way up to the point when it is indeed 'too late'. The significance of that terrible destiny, so often warned of in climate change discourse, is the final falling in of history on the present (2016, 9).

Specific methodological issues: food for thought

Maxine Berg's reference (2021, 2) to the authors' conflation of commodity frontiers with rural societies raises complicating questions regarding the difference between *extraction* of resources as commodity inputs (mining) and *production* of agricultural (and aquatic) commodities[5].[1] In largely focusing on the latter, I raise two intimately related methodological issues that may be useful: local/global dialectics, and 'ontological encounter.'

Local/Global dialectics

The authors clearly aim to avoid fetishism of commodity frontiers. That is, commodity frontiers are not without local consequence. In which case incorporation of 'frontier zones' into world market relations reorganizes local orders, sometimes several times over with the succession of regimes and technologies. This is particularly the case where landscapes are remade or rehabilitated with new commodity frontiers[6]. Recent conversions to carbon forestry are a case in point. Thus, Lacandon farmers, subjected to food regime dumping of subsidized corn in the Mexican markets, embrace carbon forestry as a survival strategy (Osborne 2011). There is a double enclosure at work: first, through the price form *campesinos* find their corn unable to compete with cheapened imported corn, forcing them to seek alternative sources of income; and second, resort to carbon forestry as the principal source of alternative income as determined by the new value of timber/forestry production subsidized by carbon credits[7]. The overall point is that imperial and global capitalism's local consequences are absolutely at issue in understanding 'the making of the modern world.'

A contemporary commodity frontier, of substantial local/global consequence, is detailed in Deborah Barndt's account of *Tomasita*, the 'corporate tomato'[8] produced in Mexico for export to ubiquitous fast food and retailing outlets of North America. The improved seed varieties originate in Mexico but are developed and patented in Israel or the United States. Such seeds need heavy doses of pesticides. The company employs hundreds of young women moved seasonally from one site to another via a mobile *maquiladora*:

> … the only Mexican inputs are the land, the sun, and the workers. … The South has been the source of the seeds, while the North has the biotechnology to alter them … the workers who produce the tomatoes do not benefit. Their role in agro-export production also denies them participation in subsistence agriculture, especially since the peso crisis in 1995, which has forced migrant workers to move to even more scattered work sites. They now travel most of the year—with little time to grow food on their own plots in their home communities . . . with this loss of control comes a spiritual loss, and a loss of a knowledge of seeds, of organic fertilisers and pesticides, of sustainable practices such as crop rotation or leaving the land fallow for a year – practices that had maintained the land for millennia (1997, 59-62).

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[5] Agroforestry represents some combination of the two, of course. Further, commodity production frontiers over time become sites of accumulation for agro-inputs, as well as agro-processors.

[6] Goldstein notes the Indonesian government's expansion of oil palm plantations onto degraded land (for rehabilitation) to avoid further deforestation (2014, 131).

[7] Termed 'new enclosures' by Peluso and Lund (2011).

[8] Named as such to mark its ethnic and gender labor origins.

Such waged work may be supplemented with remittances from the north by migrant husbands/fathers/sons. This *commodity frontier* has a broad impact, as a component of a full-scale commodity regime, premised on the globalization of export agriculture. It is symbolized by NAFTA's dumping of artificially subsidized corn in Mexican markets, undercutting local maize culture, and expelling farmers to migrate as farm labor to the US and Canada (Sexsmith 2016).

This kind of frontier regime represents histories of 'dispossession by accumulation' (to reframe the phrase), labour diasporas and migrant circuits, landscape conversion on large and continuing scale, political territorialism, coloniality, white supremacy, and uneven environmental degradation.

Anna Tsing's concept of 'friction' (2004) resonates here, in the authors' specification of ecological relations, resource competition and social resistance playing out as localized processes. Here local insertion/imposition of commodity frontiers assume an endless variety of impacts across space and time, depending on both *extant* food producing practices, the disposition of labour, and the solidity of local socio-political structures[9]. Local resistances, whether social or natural[10], shape the conditioning of commodity frontiers, reinterpreting or particularizing an essentialist market epistemology associated with global capitalism, as it imposes technologies in the quest to standardize accumulation practices[11]. Resistances compare with one another as multivalent responses in a shared global political-economic conjuncture, the 'commodity regime.'

For example, the corporate agro-export regime is dramatically captured in Amalia Leguizamón's *Seeds of Power. Environmental Injustice and Genetically Modified Soybeans in Argentina*. Here, the soy frontier on the Pampas has intensified with China's rising imports to feed its enlarged pork industry, with export revenues funding national social welfare programs. Soybeans are: "farmed from a distance, with the aid of satellites and high-tech instruments, by professionals and entrepreneurs who 'farm' from the comfort of urban settings and IT offices... [transcending] the urban/rural divide by modernization of the countryside." Meanwhile mothers mobilize around child health risks from agrochemicals: "these women bring to the table a way of 'knowing' risk that is different from modern, corporate-sponsored science ... [emerging] from felt, lived experience of taking care of loved ones, of gathering data constantly on their children" (2020, 146-7). Frontier representation defies frontier experience.

Again, the dimensions of the commodity frontier not only embody spatio-economic power relations, but also poisoning of landscapes and their human inhabitants, generating local rights struggles. And such local movements inform the work of international agrarian movements to consolidate such rights violations for global attention – described, for example, by Ingeborg Gaarde in: *Peasants Negotiating a Global Policy Space: La Vía Campesina and the Committee on World Food Security* (2017). In these senses the commodity regime embodies not only the social and biophysical dimensions of 'frontier zones,' but also local exercise of unseen global power relations, mediated by local political and economic elites (Halperin 2013). In these respects, to understand how commodity frontiers/regimes are accomplished, how local subjects receive, legitimize, and/or contest commodification is critical[12]. This is the substance of local/global dialectics, with distinctly Polanyian 'double movement' overtones, insofar as the cumulative impact of the economistic fallacy of commodity regimes is life- and Earth-threatening.

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[9] The edited volume, *Contesting Development* (McMichael 2010), registers a variety of domestic struggles against the local impacts of neoliberal political economy, exemplifying how a universal policy has a distinct local effect.

[10] Eg, monocultures, pests, superweeds, drought, firescapes, floods, and so on.

[11] Tsing's nuanced approach notes 'transnationalism' translates as either a liability (to a TNC/cronies), or an asset (to a local struggle). She argues for taking sides by making sides – that is, delineating how political voice works through translation/inter-cultural practices that are either deceptively localizing or liberatingly universalizing (2004, 212).

[12] Cf Peluso's observation that territorialization is 'an expression of relationships that emerge, operate, and converge across and within localities, national spaces, and global networks' (2005, 13).

These kinds of actions express worldwide struggles against violent commodity frontiers, and/or so-called green capitalist frontiers -- as at least a global containment strategy with respect to human rights and to time. Naomi Klein's concept of 'disaster capitalism' and its Shock Doctrine explicitly focuses on corporate mobilization to undercut counter-movements, via complicit states, and now their collective institution, the United Nations – as in its partnership with the World Economic Forum to stage a Food Systems Summit in the Fall of 2021 (McMichael 2021). That is, the local/global dialectic works both ways. Here, recent mobilization by private corporations as "trustees of society" (Schwab 2019), to capture global food governance, includes state-sanctioned alliances between agribusiness, financiers, and digital firms. Of course, this intervention was met with a massive global 'food sovereignty' countermovement (Ahkter 2021), with a broad social alliance much like the Indian uprising against PM Modi's attempt to create a new commodity frontier to corporate investment in export agriculture (Narayanan 2020).

Ontological encounter

This term addresses the mutual conditioning of distinct ontologies in conjunctures of interaction, such as commodity frontier expansion. It draws attention to ways in which socio-political systems or cultures are necessarily modified in that encounter (McMichael 2019). Commodity frontier interactive dynamics involve forms of reshaping, adaptation, accommodation, competition, and/or appropriation. I outline five kinds of encounter by way of illustration.

One specific encounter involving colonization of the New World was premised on dispossessing native peoples of their habitats[13]. Thus, following imperial orders, Sydney's first governor (1788) proclaimed immediate sovereignty over all lands in. This proclamation was informed by British philosopher John Locke's doctrine of natural law: grounding rights to landed property in the application of labour to the land. As an 1838 *Sydney Morning Herald* editorial observed of Aboriginals:

> This vast land was to them a common – they bestowed no labour upon the land – their ownership, their right, was nothing more than that of the Emu or the Kangaroo… The British people … took possession … and they had a perfect right to do so, under the Divine authority, by which man was commanded to go forth and people, and till the land (cited in McMichael 1984, 41).

Bruce Pascoe's *Dark Emu Black Seeds: Agriculture or Accident?* recaptures a civilization based in a landscape and soil management ontology of so-called 'pre-historic' people: "Aboriginal people are born of the earth and individuals within the clan had responsibilities for particular streams, grasslands, trees, crops, animals and even seasons. The life of the clan was devoted to continuance" (Pascoe 2014, 145). The Australian case is unique since settler colonization omitted formal dialogue or treaties between settlers and Indigenous people. Aboriginal land rights remained unacknowledged until late-twentieth century recurring protests precipitated the 1993 Native Title Act, stemming from the famous Mabo decision, whereby the High Court rejected the (settler) concept of *terra nullius* in favour of the common law doctrine of Aboriginal title. Nevertheless, powerful mining interests have empowered the federal government to limit Indigenous rights to negotiate, rather than veto, future developments on their land. There remain 250 groups who "retain a cultural connection to land and who still live, or wish to live, primarily in accordance with indigenous laws and customs' (Short 2016, 128). Meanwhile the Australian 'food sovereignty' movement has been recently chastised for its neglect of Indigenous sovereignty and inspired to recognize its own role in ontological encounter (Mayes 2018).

From a second, related perspective, commodification of frontier 'resources' can generate challenges that mobilize international support. This is exemplified in Joan Martinez-Alier's characterization of the 'environmentalism of the poor' (2002). Here, Indigenous peoples of necessity adopt the modern language of 'environmentalism' to protect their landscapes, even as natural reproduction is culturally

[13] Cf, Palmer (2020).

inherent. This is partly opportunistic, as local ways are not commensurate with modernist ontology, nevertheless protective adaptation to Western expression is a method of ontological interrelation[14]. Stephanie Fried's study of Kalimantan Dayak communities soliciting modern legal assistance in protecting their forests of swidden agriculture by 'writing for their lives' underscores this point (2003). Martinez-Alier notes capital's extractive imperatives generate tension "between economic time, which proceeds according to the quick rhythm imposed by capital circulation and the interest rate, and geochemical-biological time controlled by the rhythms of Nature, …expressed in the irreparable destruction of Nature and of local cultures which valued its resources differently" (2002, 215). This contradiction between different languages of valuation is captured in the distinction between a practical ontology of mangrove conservation, and the violent ontology of corporate retailing ('all the shrimp you can eat'), which plays out at a distance, with:

> the loss of livelihood for people living directly from, and also selling, mangrove products. Beyond direct human livelihood, other functions of mangroves are also lost, perhaps irreversibly, such as coastal defence against sea level rise, breeding grounds for fish, carbon sinks, repositories of biodiversity (for example, genetic resources resistant to salinity), together with aesthetic values (2002, 80).

A third ontological encounter is represented in Hannah Wittman's research depicting Brazilian landless worker struggles to realize 'agrarian citizenship' (2009). As enshrined in the 1988 Brazilian Constitution (its seventh since independence in 1822), the permission for productive occupation of speculative landholdings by the landless legitimized new settlements by the *Movimento dos Trabalhadores Sem Terra* (MST), a chapter of the international peasant coalition, *La Vía Campesina*. Wittman refers to the revaluing of small farming communities as environmental stewards in an urban-based market culture -- premised on expanding domestic commodity frontiers in the Amazon and the *Cerrado* regions via marginalization of small producers and Indigenous people. Such combinations of logics help to redefine countrysides. Here, Wittman and Blesh (2017) examine how MST camps embrace emancipatory responses where they are able to complement/replace market logic with agroecological farming, aided by President Lula's Zero Hunger Campaign, with the state providing market outlets to distribute MST staple foods to the Brazilian poor. The outcome of such action illustrates ontological encounter between capitalist relations and collective small farming cultures, exemplifying how markets can be (re)embedded in social-ecologies.

A fourth form of ontological encounter is implicit in Jan Douwe van der Ploeg's three-fold categorization of modern farmers: capitalist, entrepreneurial and peasant-like. His juxtaposition of 'value-adding' and 'ecological capital' addresses fluidity and overlap among three types of farming. Van der Ploeg's research in Europe and Latin America reveals widespread interaction especially between entrepreneurial and 'peasant' farming (2009). This underlies the expansion of 'value-chain farming' since the early 2000s, fostered by public-private partnerships (PPPs) to integrate small producers into commercial, monocrop agriculture, requiring purchase of agro-inputs. Inflation of the latter, alongside the volatility of single crop commerce, has resulted in rising value-chain farming indebtedness (McMichael 2013). The initial ontological encounter as small-producers adopt value-chain agriculture generates a process whereby farmers withdraw from commercial engagement and rebuild and self-manage their material base as 'ecological capital' (van der Ploeg 2009), reconstituting farming along agroecological lines (eg, Khadese et al 2018). Here, farming is practised as co-production, involving the interaction and mutual transformation of human actors, and living nature (Schneider and McMichael 2010, Da Viá 2012). In modernist ontology such 're-peasantization' is routinely invisibilized: "peasant-like ways of farming often exist as practices without theoretical representation. Hence, they cannot be properly understood, which normally fuels the conclusion that they do not exist or that they are, at best, some irrelevant anomaly" (van der Ploeg 2009, 19). This may be obscured by engagement in pluriactivity and other non-agrarian activities – in many

[14] This approach is exemplified in the film, 'The Kayapo: Out of the Forest,' appealing to international audiences to support Amazonian Indians in their struggle against a hydroelectric dam: https://www.imdb.com/title/tt2575058/1989, and a similar appeal by Brazilian rubber tappers to protect the forest: https://pulitzercenter.org/stories/green-jobs-could-help-save-amazon.

cases a necessary, but not sufficient, condition of existence or survival for modern peasantries, or Indigenous peoples, as they retain attachment to the countryside and knowledge of its cultivation[15].

A fifth kind of ontological encounter is represented by 'climate-smart agriculture' (CSA). In 2014, the UN launched *The Global Alliance for Climate-Smart Agriculture* (GACSA), represented as a "voluntary, farmer-led, multi-stakeholder, action-oriented coalition committed to the incorporation of climate-smart approaches within food and agricultural systems" (United Nations 2014). Purveyed by the corporate and institutional world, CSA 'frontiering' is an outcome of ontological encounter insofar as it represents partial appropriation of agroecological practices. But it operates largely as a rebranding exercise, in leveraging climate change as a vehicle for accumulation via intensification of existing technologies (Taylor 2018).

The notion of 'ontological encounter' might serve as a method to depict the mutual conditioning of socio-ecological arrangements. The preceding examples illustrate what are often referred to as 'hybrid' outcomes. Interactions involve quite distinctive ways of facing off, usually in one-way directions, but not without various forms of resistance, in adaptation, impasse, or rejection. The methodological goal is to recognize that a 'commodity frontier' represents some *composite re-ordering*. Likewise, a 'commodity regime' would be constituted by conjunctural countryside histories, where, however geographically specific, they embody common historical forces structuring conjunctural tensions which in turn shape successive regimes.

Ontology is an effective way of analyzing the historical forces, relations and assumptions that constitute governing practices of socio-ecological organization. Hugh Campbell's recent book, *Farming Inside Invisible Worlds* (2020), is a powerful account of the mis/fortunes of settler modernist farming ontology in *New* Zealand over time. The settler farm, as unit of analysis, encloses land and pastoral family identity via an ontology at odds with extant island socio-ecological relations, overriding Māori and landscape ecologies. Campbell's ontological method reconstructs settler farming as a boundary-making sentiment and enterprise. Initially, New Zealand represented the consummate 'British farm,' in violent encounter with 'early' *Aotearoan* gardens. And as farm *unit* productivism and homogenizing technologies encounter *enveloping* eco-system dynamics, and rising environmentalist and Indigenous rights politics in the present, ontological encounter illuminates the changing fortunes of modernist agriculture[16].

These political-ecological dynamics come to erode the sustainability and legitimacy of settler farming, as a model of modernist agricultural political-economic boundary-making. Here, Campbell raises the question of how to conceptualize adoption of alternative ecological measures in New Zealand's contemporary landscapes. In posing the critical question: "alternative to what?" (2020, 20), he invokes the common (and problematic) conventional/alternative binary. As argued here, the encounter itself embodies reconciliation, generating postcolonial forms of farming and revitalizing territorial/nested food markets.

In short, addressing 'ontological encounter' enables engagement with the consequences of commodity frontiers that are so often erased, displaced, or devalued. To recover what has been lost or simply discounted in the encounter enables a more robust depiction of countryside histories, rather than projecting a modernist assumption that they all eventually resolve into a singular, universal form. All such ontological encounters may have their particularities, but since 'outcomes' are historical, they embody broader meanings and dynamics. Campbell's story of settler farming ultimately encounters its antitheses, ignored for two centuries, but now requiring resolution.

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[15] For example, Peruvian Indian, Justo Oxa: 'The community, the ayllu, is not only a territory where a group of people live; it is more than that. It is a dynamic space where the whole community of beings that exist in the world lives; this includes humans, plants, animals, the mountains, the rivers, the rain, etc. All are related like a family. It is important to remember that this place is not where we are from, it is who we are (quoted in de la Cadena 2010, 352). Here: "just as people have a right to their land, so land has a right to its people" (Grey and Patel 2015, 436) which fully captures Indigenous ontology in the practical, rather than abstract, sense.

[16] Cf, Symposium on Farming in Invisible Worlds: https://link.springer.com/article/10.1007/s41130-021-00157-9.

On a world-historical scale such encounters are expressed in the current politicization of ongoing enclosure[17] of small farming (and Indigenous) systems - led by the International Planning Committee for Food Sovereignty (IPC), *through* ecological makeovers on farms at various scales for soil/farm resilience (cf, IPES-Food 2018, Khadse et al 2018, Philpott 2020), to recent recognition of Agroecology by the UN Committee on World Food Security (CFS/HLPE Report, 2019). Today we are experiencing ecological consequences, and while 'agribusiness as usual'[18] and agroecology are ontologically distinctive, they condition one another -- in a self-forming, contradictory conjuncture.

Such ontological encounter is necessarily historical, with variable outcomes: long-term environmental devastation and ongoing climate emergency, short-term agricultural bounty via PPPs, 'climate-smart agriculture' and its contradictions[19], 're-peasantization,' agroecological experimentation and other emancipatory possibilities (Rosset et al 2019, Toledo 2022), and remaking industrial agriculture frontiers[20].

In sum, such ontologies are more than ideal types, since they are historically produced/enacted, and therefore comparable as mutually conditioning, defining conjunctural relations. Insofar as their interdependencies express frontier *and* world ordering, taking account of their encounters may be of methodological assistance to this project -- in offering a more complex account of the overlapping tensions and possibilities in each historical conjuncture.

Conclusion

While I have concentrated on more contemporary commodity frontier remaking of countrysides, offering methodological suggestions for the instances addressed, there is great variety of such frontiers across space-time. Addressing encounters between local and global ontologies may not only help to historicize countrysides, but also, to the extent such ontologies evolve, the encounters may signify new, or transitional, commodity regimes. The trick here is to develop a rubric for capturing representative frontier complexes across the centuries, including how they reflect techno-political transformations, as suggested in the proposal.

One final comment concerns the development of digital frontiers via bio-physical mapping techniques. Arguably an extension of land grabbing, digitalization represents a 'data grab' (Fraser 2019). Each square kilometer, with every square centimeter of farmland, is undergoing mapping, "for soil, nutrients, moisture, and sunshine, and combining that with massive genomic data sets to suggest AI-designed 'climate-smart' agroecosystems building from DNA upwards, [and] ecosystems will be engineered for optimal performance" (IPES-Food and ETC Group 2021, 63). Bio-digital technologies in northern large-scale industrial agricultural regions[21] are now selecting converted land in the global South as a new data frontier. These interventions introduce 'precision agriculture,' where sensors can generate remote information for managing machinery and fertilizer and chemical applications to targeted units of land for efficiency and yield increase, with data blockchain consolidation providing "value for seed and chemical firms, agronomists, co-operatives, farm insurance providers, and machinery firms" (Fraser 2019, 899). In the global South, infrastructures to extend digital surveillance techniques are in their infancy, however data ('new soil') "from new parts

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[17] Whether through land grabbing, value-chaining, or market predation (cheap food dumping, reduction of public supports, rising agro-input costs), for example.

[18] Cf the International Assessment of Agricultural Science & Technology for Development (IAASTD 2008).

[19] Sustainable Rice Intensification (SRI), in West Africa (https://sriwestafrica.org/) and India (Vidal 2014, 2019): SRI substantially reduces powerful methane gas emissions, encouraging rice-using companies like Mars and Kelloggs, and the agribusiness colossus Olam to set up the Sustainable Rice Platform (SRP).

[20] And in the case of commodity frontiers of mining, the phenomenon of private equity firms competing for Congolese cobalt in this so-called 'green capitalism' moment captures a further paradox of ontological encounter.

[21] Where they are used on "over 75% of corn acres in the United States, 80% of grain farms in Australia and two-thirds of all arable land in the Netherlands" (Stone 2022, 2).

of the world and different types of cultivation systems are crucial to the development of digital technologies and algorithms" (Stone 2022, 5, 9). This phenomenon anticipates a new, distinctive, and powerful commodity frontier/regime all in one…

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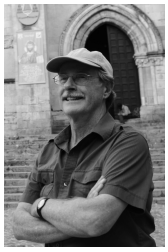

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