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# Automated agrifood futures: robotics, labor and the distributive politics of digital agriculture

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**ABSTRACT**

This paper draws from interviews with (1) US farmers who have adopted automated systems; (2) individuals employed by North American firms that engineer, manufacture, and/or repair these technologies; and (3) US farm laborers (immigrant and domestic) and representatives from farm labor organizations. The argument draws from the literature interrogating the fictional expectations that underlie capitalist reproduction, reading it through a distributed (ontological) lens. The framework questions whether concepts like 'automation' and 'skill' provide sufficient analytic and conceptual clarity to critically engage these platforms and suggests that we think about what these technologies *do* rather than fixate on what each *is*.

**KEYWORDS**

Automation; smart farming; imaginary; sociotechnical; anticipatory action; temporality

## Introduction

I was struck first by its sound: a low hum of the engine overlaid by a hiss that reminded me of a leaky garden hose. I was watching an automated romaine lettuce harvester in action. The machine could pick six heads at a time with the help of high-pressure water jets that slice through the vegetable like a knife through soft butter. I was told that water is better for the crop as the cut cauterizes, therefore reducing 'lettuce bleeding'. The machine also uses positive-charged water that kill the pathogens, reducing the need for chlorine. The principle reason its owners made this investment, however, is due to the fact that it reduces the amount – and as I later learned the *type* – of labor needed. The machine was a veritable factory on wheels. Once cut, heads were mechanically carried on conveyer belts to a table, where laborers washed, inspected, sorted, and placed the goods into crates.

I was looking at what its operators termed the 'water knife bot'. Yet this 'thing' observed on that hot day was more, a lot more, than just an expensive mist-enveloped machine on wheels. It had politics (Haraway 2003; Winner 1980) and futured (capitalist) imaginaries (Beckert 2016) that helped make real certain forms of life over others (Foucault 2003).

This paper is based on interviews with three distinct but interrelated groups: (1) farmers (owners, owner-operators, and farm managers) who adopted automated systems; (2) individuals from firms that engineer and manufacture these technologies and those who

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repair them; and (3) farm laborers (immigrant and domestic) and representatives from farm labor organizations. Conceptually, this paper is situated within two related literatures.

The first explores the futured-ness of industrial agrifood automation. Agrifood scholars have linked the dynamic structural changes in agriculture over the last century to a wide range of factors, including capitalism's ability to (eventually) overcome biophysical barriers through appropriation and substitution (e.g. Goodman, Sorj, and Wilkinson 1987; Mann 1990; Mann and Dickinson 1978), competing views of what it means to be a 'good' farmer (e.g. Burton 2004; McGuire, Morton, and Cast 2013), globalization (e.g. Koc and Dahlberg 1999; Swinnen 2007), and a treadmill-like logic that reinforces intensification and corporate dependencies (Nicholls and Altieri 1997; Obach 2007; Ward 1993). And yet, as compelling as these accounts are, most pay little if any attention to an aspect of agriculture that is central to its functioning and existence, namely, its temporal order, particularly the contested imagined futures that animate action and shape thought within this space.

A handful of scholars (e.g. Beckert 2016; Bourdieu 1979) have argued that capitalist reproduction is possible only because of a specific theory of fictional expectations:

> Fictional expectations are ubiquitous and keep the capitalist machine going. But expectations are central to almost any aspect of social action, not just economic behavior. It is surprising that they have eluded sociologists for so long. (Boldizzoni 2017, 260–261)

Anticipatory geographies accomplish this feat by ensuring a continuous flow of investment, consumption, trade, and government spending (Anderson 2010). Take the 'fiction' (Polanyi 2001) of credit, which enables firms to engage in economic activities with yet-to-be-earned resources obtained on the premise of imagined future outputs, market prices, demand, weather, and profits. 'Despite very consequential moments of crisis,' Beckert argues (2016, 96), 'capitalism has succeeded more than any other economic and social system in inspiring actors to believe that they should restlessly imagine and embark on new paths.' The quest to envision *new* paths should not be conflated with a mandate to allow *any* paths to take root, however. Some outlooks and practices are made thinkable more than others in neoliberal imaginaries.

The sociological underpinnings of 'the' future bring us to the subject of digital agriculture. Futures are acutely present when attention turns to automation and robotics, making the subject of digital agriculture a fitting one for interrogating how fictional expectations are made real, while others are, to evoke Foucault (2003, 241), left to die.[1] As discussed in greater detail below, agriculture itself is inherently futured – anticipatory in a way that is equal parts future, present and past (Anderson 2010). Industrial foodscapes are no different, as evidenced by, for instance, the productivist stories we are being fed. To quote the first lines of a recent piece from *The Atlantic* celebrating the virtues of precision agriculture, titled, 'Precision Agriculture Could Help Feed the World':

> The world is about to need more food. A lot more. By 2050, the UN estimates, a global population of 9.6 billion people will require 70 percent more calories than are currently consumed. (The Atlantic 2018; see also Cackler 2015)

[1]Digital agriculture: a catchall term that includes 'milking robots on dairy farms to greenhouses with fully-automated climate control […] [and] smart farm machinery equipped with real-time kinematic global navigation satellite systems and other sensors' (Cornell Experiment Station 2018).

Anticipatory actions make certain food futures real. Our quest to feed future bodies, which we anticipate will eat a particular way, which for a lot of the world is taken to mean more meat, less millets, sorghum and pulses (Neo 2018), is of consequence. The same can be said of the steps we take to keep farms operating in light of an expected tightening in labor markets, thanks to the building of literal and figurative walls between nations.

The second literature that this paper speaks to concerns political ontologies, which recognizes that the coherence of any object is an analytic effect (Deleuze 2006; Fregonese 2017; Haraway 2003; Latour 2000). Doing this pluralizes the sites of politics and diversifies who is a political subject as 'things' are contested and made (Bissell 2018). In the words of Berlant (2016, 394), 'objectness is only a semblance, a seeming, a projection effect of interest in a thing we are trying to stabilize'. Latour (2000, 119) made a similar comment when talking about material phenomena, referring to them as being 'much too real to be representations and much too disputed to play the role of stable, obdurate, boring primary qualities, furnishing the universe once and for all.'

One way to talk about this distributed ontology is through Foucault's (1980) concept of the *dispositif*. The term is a reminder to decenter 'things' (e.g. a robotic milking parlor); to view objects as a 'thoroughly heterogeneous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, [and] philosophical, moral and philanthropic propositions' that enhance and maintain ways of life (Foucault 1980, 94). While not always made explicit by Foucault, the concept includes embodiments, practices, and affectivities, without which *dispositif* risks portraying what is and what ought to be as static and dead. Rather than trying to identify what automation *is* I argue on behalf of identifying these sociotechnical assemblages by what they *do*. This post-structural move provides tools to engage in a needed unpacking when it comes to talking about the concepts of 'automation' and 'skill', showing both to be accomplishments of a distributive network of human and non-human phenomena (Richardson and Bissell 2017, 2).

The paper proceeds as follows. The following section sets the conceptual and empirical stage for the study and analyses that follow. It begins by describing in greater detail the temporal order of industrial agriculture by situating these practices within broader futured capitalist imaginaries. The section then pivots to the subject of robotics in agriculture, describing trends as well as some of its anticipatory, and performative, elements; subjects that will be explored in greater empirical detail in the findings section. A description of the methods is then presented. The remainder of the paper discusses themes that emerged out of the qualitative interviews, dealing with the subjects of labor and political ontologies (i.e. *dispositif*), respectively.

The paper concludes drawing inspiration from Barry's (2002) analytic distinction between 'politics' and the 'political'. Politics, according to this framework, is 'a set of technical practices, forms of knowledge and institutions', while the political is 'an index of the space of disagreement' (Barry 2002, 270). The question I will tentatively speak to in the conclusion is, 'To what extent is this space of disagreement in automated foodscapes foreclosed by a specific kind of politics?' For Barry, to engage in a politics that stifles the political is to speak of techniques and institutional arrangements that have an *anti*-political character. Looking at what automation *does* versus trying to define what it *is* allows us to call out those platforms that are anti-political.

## Farming for tomorrow today: setting the conceptual stage

Abbott (2005) observed that sociologists and economists approach explaining present events differently. In his words, 'While sociologists see present events as a final outcome emerging from the past, economists reason backwards from the future: Decisions are explained by the present value of expected future rewards' (p. 406). It is hard to argue with the point that sociology places considerable analytic and conceptual weight on the past – e.g. Marxian historical materialism (Marx 1993), Foucault's (1982) archaeological/genealogical approach to the history of thought, Durkheimian historicism (Durkheim 1997; see also, e.g. Bellah 1959).

As a generalization, Abbott's point has merit. But like any sweeping statement, it overreaches. The field of institutional economics, for example, through its concept of path dependency (see, e.g. North 1995), places significant explanatory weight on the past, as evidenced by the conceptual and analytic weight allocated sunk costs. Meanwhile, a handful of social theorists have demonstrated sensitivity to the (imagined) future's causal efficacy on the present, approaching 'the future' as effectively a Durkheimian social fact (see e.g. Beckert 2016; Bourdieu 1979; Giddens 1999; Koselleck 2004; Luhmann 1976).

The future, according to these scholars, was understood and acted upon very differently centuries ago compared to how it is generally grasped today. There is a degree of variation in this scholarship about how 'traditional' societies thought about the future – as a continuation of the present (e.g. cyclical: simple reproduction, in Marxist terminology) (Bourdieu 1979), largely predetermined (Luhmann 1976), as having a clear end point (Koselleck 2004), etc. All, however, share in the conviction that the future today is understood by actors to be open and uncertain. Examples of arguments of this ilk include the following:

> It was only the structural change from traditional to bourgeois society in the seventeenth and eighteenth centuries which dissolved this older notion and replaced it by a temporal structure that contains in itself the possibility of higher complexity. (Luhmann 1976, 130–131)

> In contrast to traditional economic systems, capitalism institutionalizes an organization of economic activity in which actors orient themselves toward an open and unforeseeable future. (Beckert 2015)

Bourdieu (1979; see also 2013) offers one of most nuanced and empirically detailed ethnographic accounts of this transition, studying the social and economic transformation in the 1950s of the Kabyle people in French-controlled Algeria. Traditional Kabylian imaginaries eroded as exchanges came under the control of markets and became viewed through the lens of money, calculation, and future profits. It was not that the prior Kabylian social order was grounded solely in the present. Kabylian farmers planned meticulously. Farming is, after all, inherently future-oriented, contingent on activities animated by, for instance, visions of pending hunger and other basic needs, anticipated seasons, and one's own mortality (e.g. the need to find an eventual successor and/or caretaker). To quote Bourdieu (2013, 55), as he attempts to distinguish between the futured-presents of traditional societies compared to capitalist ones:

> We must then make a clear distinction between putting [aside] reserves, which means subtracting part of the direct goods in order to reserve this for future consumption and implies foresight and abstention from consumption, and capitalist accumulation, 'creative saving' that leads to setting aside indirect goods with a view to their productive use.

There is a clear performative element to all of this, though some of Bourdieu's language obfuscates this. For instance, in justifying why 'objective probabilities' (i.e. the future) ought to be treated as Durkheimian social facts he criticizes Marxists for being 'blind to reality to reduce the economic agents to mere reflections of the economic structures and to fail to pose the problem of *the genesis* of economic dispositions and of the economic and social conditions of their genesis' (Bourdieu 1979, vii, my emphasis). Yet two sentences later he undercuts what could be a dynamic performative argument by arguing that 'these dispositions are *structured structures* which function as *structuring structures*, orienting and organizing the economic practices of daily life – purchases, saving, and credit – and also political representations, whether resigned or revolutionary' (Bourdieu 1979, vii–viii, my emphasis).

Implicit in Bourdieu's argument is the position that imagining futures through the lens of calculation, profits, and markets *make worlds* that are distinctly different from imaginaries premised on solidarity, reciprocity, and simple reproduction. This argument also overlaps with the central premise of Michel Callon-inspired economic geography (e.g. Callon 2016; Callon and Muniesa 2005; MacKenzie and Millo 2003). Through the concept of marketization, what matters is not so much the accuracy of economic models in depicting the economy but how they intervene and change what they are said to describe. The discipline of economics, according to this literature, can best be described as performative (*enacting* worlds) rather than purely constantive (*describing* worlds) (Austin 1961). This also helps explains why, according to Abbott (2005), fields of economics seem more attuned to the future. Economists are not so much describing today's uniquely futured market societies but are instrumental in helping make them.

As already mentioned, agriculture is at its essence a futured activity. Though as Bourdieu (1979) points out, under capitalist modes of production those futures tend to be distant, abstract, and calculable, as exemplified by, for instance, crop insurance, futures markets, and its capital intensity. Weber ([1927] 2003) describes how Silesian peasants responded to capitalist incentives in the nineteenth century designed to increase their productivity. The Silesian landowners offered laborers higher wages to encourage them to work longer hours. This tactic assumed that the peasants held capitalist imaginaries driven by personal accumulation and a desire for wealth. Yet instead of working more, the landless laborers chose to work less, satisfied in the maintenance of their existing standard of living (see also Beckert 2016, 25).

Another uniquely futured example taken from an agrifood context: capital intensity. This process assumes a particular (capitalist) futured-present. It would make no 'sense' to purchase equipment that costs in excess of US$100,000 or to make expensive capital improvements (e.g. irrigation systems, buildings, fencing) in the absence of internalized values around surplus value and profit. Not to mention that the very ability to purchase any of this high-dollar equipment would not be possible without credit, which would not exist without a distinct theory of fictional expectations. Anticipatory ideas around asset depreciation, variable costs models, and interest all factor into whether someone qualifies for a loan of this magnitude.

The green revolution has been criticized for its role in changing the materiality of foodscapes (Carolan 2018c; Patel 2013). Less discussed in the literature, if at all, is its role in changing the *temporal* politics of these spaces. Initially pioneered by the Ford Foundation, the green revolution was not any one thing but constituted what was described at the

time as a complete 'package of practices' (Borlaug 2006, 4; Farmer 1986, 176), 'including credit, modern inputs, price incentives, marketing facilities, and technical advices' (Chandra Lal Das 1993, 129). This package (*dispositif*) gave rise to a very distinct futured-present. Such an imaginary is evident in those accounts where the suite of practices failed to produce the requisite results: e.g.,

> Refusal of farmers to stretch out their hands with gratitude and to accept any or all of the content of the proffered 'package of practices' is seen as resistance to change attributable to ignorance or stupidity and to be overcome by massive extension exercises. (Farmer 1986, 184)

A firsthand account of this temporal shift was captured in a 1969 article based on site visits to two of the principal districts of Punjab, India, where the green revolution was well underway (Ladejinsky 1969). At one point in the essay, describing transformations where 'peasants' became 'farmers', the author tells of how the green revolution turned actors into calculating agents. In one particular instance, Punjab farmers described as having enrolled in the aforementioned package of practices felt pressure to continually increase their yields and adopt ever-new 'miracle varieties' due imagined futures stricken by overproduction and decreasing commodities prices. In the author's words,

> He [*sic*] and other progressive farmers knew that the total wheat output and marketable surplus would be larger than last year and the chances of a drop in price, whether officially procured or not, was real. (Ladejinsky 1969, A-74)

As calculating agents, then, these farmers needed to increase yields year after year in *anticipation* of overproduction and the downward pressure it would place on markets.

Examining agriculture's so called 'robotic revolution' (Giles 2018) through this lens furthers the nascent critical social science literature on digital foodscapes (e.g. Bronson 2018; Carolan 2017a, 2017b, 2018a, 2018b; Fraser 2018; Higgins et al. 2017). Analogue technologies have been changing agriculture for centuries: the cotton gin in 1793, which separated the cotton lint from the seed; the threshing machine in 1816, which separated grain from the stalk; the John Deere steel plow in 1837, which cut deep and efficiently; and Cyrus McCormick's reaper in 1834, which cut grain. The number of human hours required to farm an acre of corn in the U.S. dropped rapidly throughout the first half of the twentieth century thanks to (analogue) automation, namely, corn pickers and, later, combines – from 38 h per acre in 1900 to 33 h in 1920–1924, 28 h in 1930–1934, 25 h in 1940–1944, and 10 h in 1955–1959 (Colbert 2000). During the latter half of the twentieth century, automation transformed how certain commodities (and varieties) were grown and processed. The canning industry in California, for instance, employed more than 100,000 Teamster Joint Council 7 workers in the 1970s. Today that figure is closer to 15,000 (Held 2018).

Case IH and New Holland introduced their new autonomous tractors at the 2016 Farm Progress Show to much fanfare. The New Holland tractor can be controlled in the comfort of one's home from a PC or tablet. Other tractors can be programed to do the driving and input applications on their own. The French company Naio Technologies engineered a tractor that uses laser and camera guidance to navigate between rows of fruits and vegetables while its sensors can identify each individual plant, 'looking' for weeds. The machine runs on electric batteries and can operate three hours before needing a recharge.

Such spraying and weeding 'bots' promise to help farmers two-fold: first, by reducing the amount of labor needed (and thus labor costs); second, by cutting back on the amount of pesticides applied thanks to being integrated with cloud-based precision agriculture platforms (thus reducing input costs). To quote one pro-automation publication, 'Farmers save on product cost while producing healthier, safer crops' (Gonzales 2018). John Deere, meanwhile, recently invested US$305 million for a start-up – Blue River Technology – that makes 'see-and-spray' robots (Kolodny 2017).

Another growth area for robotics is in milking machines. While fewer than five percent of U.S. dairy farms utilize robots, that figure is expected to increase by 20–30 percent annually 'for the foreseeable future' (Mulvany 2018). Robotics in dairy farming globally is already a US$1.6 billion industry (Mulvany 2018).

Adoption of technologies in agriculture has always been intertwined with imagined futures. The agricultural treadmill famously described by Cochrane (1958), for instance, has been interpreted as a theory of agricultural change that looks *back*, where for reasons related to path dependencies and various lock-in tendencies farmers face pressures to intensify their operations (e.g. Sutherland et al. 2012; Ward 1993).

Less discussed, however, is the theory's implied *forward-looking* orientation. The treadmill logic has been explained as follows:

> 'Early adopters' make profits for a short while because of their lower unit production costs. As more farmers adopt the technology, however, production goes up, prices go down, and profits are no longer possible even with the lower production costs. Average farmers are nonetheless forced by lower product prices to adopt the technology and lower their production costs if they are to survive at all. The 'laggard' farmers who do not adopt new technologies are lost in the price squeeze and leave room for their more successful neighbors to expand. (Levins and Cochrane 1996, 550)

Not unlike the earlier explained futured-presents describing why farmers in Punjab, India, chose to transition away from peasantry, the treadmill logic describes a unique temporal orientation, one where the agent reads future markets signals and comes to anticipate ever-decreasing commodity prices and ever-increasing surpluses. There is a name for that orientation: productivist (Ward 1993). One unsaid element of this outlook, however, needs naming, which is also implied in the treadmill logic. Productivism presumes the following temporal element, namely, it anticipates that future farmers will be animated by productivist ideologies too.

Not all 'bots', however, have the same politics (Bissell 2018; Carolan 2017a, 2017b, 2018b; Warf 2001), which is to say, some are political while others are more anti-political in their politics (Barry 2002). Those in the latter category seek to maintain the status quo, acting 'as a strategic containment of potentially more radical futures' (Braun 2015, 1) by enlisting productivist imaginaries. Examples include narratives about 'needing' to double crop yields by 2020 (e.g. Delta Farm Press 2013; Monsanto 2008) and futures that take as given capital/energy intensity (e.g. the 'need' for 4G, or even 5G, connectivity across thousands of acres and the high dollar 'smart' equipment needed to capitalize on these platforms [see e.g. Maddox 2018]).

The above review positions us to be more intentional in our explorations into agrifood futures as social facts, particularly as we grapple with digital platforms. It also leads me to the concept of *dispositif*. As I have tried to indicate above, the constitution of futures

cannot be reduced to any one principle driver. The same applies to the discrete concepts (automation, skill, etc.) and phenomena (robotic milkers, bots, software, algorithms, etc.) related to the digital transitions underway in agriculture – their discreteness is an accomplishment, not a given. A concept like *dispositif* gives space for contingency, emergence, multi-directional contestation, and multiplicity, processes that were all documented in the data assembled for this research.

Some might find confusing my undisciplined use of *dispositif*, as I evoke it in tandem with concepts like 'assemblage' and with reference to such theorists as Latour, Callon, and others. This is in keeping with literature that I draw inspiration from. Note, for example, Ash, Kitchin, and Leszczynski's (2018, 36–37) invitation to 'critically reflect upon the wider dispositif or assemblage of the digital', while Bellanova's (2017, p. 329) examination of digital mass surveillance claims to be 'building on governmentality studies and Actor-Network-Theory […] using the conceptual tool of dispositifs' (other examples include, e.g., Braun 2014 and Coté 2014). Using the concepts in tandem allows the argument to deflect potential critiques that risk weakening either if used in isolation (e.g. ANT struggles to account for power [Elder-Vass 2015]; Foucault's post structuralism is more structuralism than post [Butler 1989]).

## Methods

This paper is based on interviews with three distinct groups: (1) farmers who have adopted automated systems; (2) individuals from firms engineering and manufacturing these technologies and those who repair them; and (3) farm laborers (immigrant and domestic) and representatives from farm labor organizations. I will speak about the involvement of each group in turn, before describing methodological elements that each shared.

The farmer group consists of forty-five interviews with producers who had adopted one or multiple robotic technologies in their farm enterprise. 'Farmers', for this particular research, included farm owners, farm owner-operators, and (non-owner) farm managers. Those interviewed resided in the U.S. states of California, Illinois, Iowa, and Nebraska. (The selection of states was an artifact of following a snowball sampling methodology to wherever it took me.) The sample began by reaching out to individuals known to myself who either adopted such a technology or who were acquainted with someone who had. I also took the opportunity when interviewing individuals from the industry sample, which included those who repair and install agro-robotics, to ask if they could supply names of clients. Farm size among respondents, defined in terms of annual revenue (farm product sales plus government payments), varied considerably: 6 reported in excess of US$5 million; 19 reported between US$1 million and US$5 million; 14 reported between US $500,000 and US$999,999; and 6 reported between US$100,000 and US$499,000. Interviewees came from operations producing the following commodities: dairy, grapes, strawberries, lettuce, almonds, potatoes, indoor vegetable and cut flowers, and grain.

The second group consists of thirty-six individuals who developed, designed, installed, and/or repaired this equipment. As with the previous group, the sample began with me reaching out to personal contacts, asking for interviews as well as for names of potential respondents. Individuals who employ these platforms on their farm were also asked for the names and contact information of their providers. To ensure members from this group were interviewed, I purposefully sought out those who performed repairs but who were

not credentialized – e.g. those with the skills, knowledge, and experience but who were not recognized as 'authorized' technicians. Twenty-six of the respondents from this group were employed and/or certified to make repairs by a robotic firm. The remainder ($n = 9$) had the skills to make repairs and did so occasionally – in some cases illegally – but lacked any formal credentials. Respondents from this group resided in U.S. ($n = 25$) and Canada ($n = 11$).

The third group is reflected in twenty-four interviews. Sixteen of those interviews are with farm laborers – immigrant ($n = 4$) and domestic ($n = 12$). The remainder ($n = 8$) consist of interviews with representatives from farm labor organizations. Respondents were located in the U.S. states of California, Illinois, Iowa, and Nebraska. Interviews were conducted in English, including those with immigrants. (Farmers/employers especially in the Midwest are largely monolingual and thus place a premium on migrant labor that speaks English well.) I identified potential respondents by asking to interview 'hired hands' when interviewing respondents from the first group (farmers). The sample population consists of full-time and temporary laborers. Names of potential interviewees were also collected from area farm labor organizations and their representatives.

For all samples, interviews ceased at the point of theoretical saturation, which speaks to an iterative style of doing qualitative research where the researcher continues sampling and analyzing data until no new themes emerge and concepts and linkages between concepts that form the theory are verified and well-developed. At this point, it can be argued that no new data are needed (Glaser 1992; Strauss and Corbin 1998). Interviews for all three groups occurred concurrently from November 2016 to February 2018. This timeframe is important as it means that all interviews occurred *after* the 2016 Presidential elections, a time period rich with the implementation of various laws and Executive Orders directed at immigrants and immigration law.

Interviews started by talking about the respondent's occupation. Questions were asked about phenomena like their employment history, job duties, and career goals. (These questions were phrased to fit with whom I was talking to – e.g. farmers would justifiably be confused if asked about 'their job's duties'.) Shortly thereafter the conversation pivoted, if it had not already, to larger questions about the platforms in question – e.g. what are they 'solutions' to, what 'needs' do they fill, do they present any 'challenges', and the like. Interviews concluded discussing future trends and applications in terms of phenomena like big data, robotics, and Artificial Intelligence (A.I.). Interviews lasted an average of 90 min, were recorded, and later transcribed. I also spent between one and two hours observing the digital artifact (or artifacts) in question, when possible and applicable.

Interviews were recorded, transcribed, and coded. Qualitative data analysis protocols were similar for all three groups. Two research assistants and I trained in qualitative methods using NVivo software independently coded two randomly selected transcripts for each group and any inconsistencies in coding were reviewed until consensus was reached. I coded all remaining transcripts, using those initial codes as a guide. Only adults were interviewed. Pseudonyms are used to protect the anonymity of respondents.

## Findings: robots have politics and time

This section is organized around two themes. The first addresses certain futured-presents that animated automation among respondents through the lens of labor – hired labor and

the owner operator's own labor. The second speaks more specifically to the political ontology of farm 'bots', where traditionally static concepts like 'automation' and 'skill' are decentered. These themes together set up the paper's conclusion, where I discuss the politics that these platforms make real.

## Enacting labor markets and Disrupting farmer persistence

'Talk to any dairyman. They have two things on their mind: the price of milk and the future costs and availability of labor.' This quote comes from Neal, an Iowa dairy producer who recently installed milking robots on his farm. All the farmers I talked to believed labor scarcity would be a permanent fixture of agriculture; a future reality most respondents felt had been hastened by the Trump administration's closed-borders immigration policies.

'This' – pointing in the direction of his milking parlor – 'was a bet, not a slam dunk.' He went on to explain how he had been interested in automated milking parlors for close to ten years before making the investment. When asked what changed to spur him to make the purchase his answer was immediate: 'labor and credit'. Citing the election of Trump and the nation's surging economy, he felt strongly that immigrant labor would only become harder to come by, while domestic laborers 'are starting to have their pick of jobs, and for many working on the farm isn't a first option.' Those futured-presents, coupled with the availability of historically low interest rates (an artifact of the Federal Reserve's anticipated future), motivated Neal to 'take the plunge and make the investment.'

As explained by a sales representative with a milking robotics company (Jeff), 'With these automated systems, farmers are essentially prepaying their labor costs for the next seven to ten years, depending on the conditions of the loan and the price of actual labor'. Hence Neal's reference to the investment being a 'bet' versus a 'slam dunk'. He was anticipating continually increasing labor costs that would shrink the timeline with him being 'happy', in his words, 'to just break even,' which describes his current economic outlook, to having labor off his balance sheet entirely.

According to the latest semiannual Farm Labor report from the USDA's National Ag Statistics Service (USDA 2018), farm operators pay their hired workers an average wage of US$13.72 per hour. Neal paid his hired hands a little more, between US$15 and US $20 an hour, though he admitted to letting go one full time worker ($15/hour) and one part time worker (US$12/hour) after the robotic system went online. The bet, however, is that labor prices will continue to creep well beyond US$20/hour. According to various economic modeling projections – assessing hypothetical labor costs, interest rates, feed prices, and milk prices – the consensus is that these systems become economically comparable with traditional milking systems when labor costs are somewhere between US$25 and US$32 an hour (see e.g. Extension 2017; Mulvany 2018).

Being familiar with these calculations, I asked how his operation manages to be profitable. His answer was both elusive and informative. The elusiveness was reflected in the fact that he never really answered my question about how the automated milking system compares in terms of its profitability relative to his former (non-automated) parlor. The closest he came to answering the question came when we explained, 'It has been tight; low milk prices aren't helping. This is a long-term investment. The numbers might not always work in my favor now, but I'm betting that they will in the future.'

Note the reference to a very specific future imaginary that is animating Neal's actions in very real ways today.

Not long after, Neal added the following:

> You have to look at the entire farming operation. Now that I no longer have to worry about all those damn milkings I'm free to do other things, tend to my calves, spend time with my kids. And my wife: she used to help out milking and with the calves; now she has gotten a job [off the farm].

When automation is discussed in the context of labor the discussion is often about the *non-family* labor displaced. But as Neal's quote illustrates, automation also has the potential to displace *family* labor, which can contribute to farm persistence. In Neal's case, his wife secured a full time job with benefits and an annual salary that in most years surpasses what he makes selling milk. This led Neal to quip, with a chuckle, 'Thanks to that job, which I attribute significantly to [the milking robot], the future viability of this farm is secure.'

The performativity of these futured-presents exist at multiple levels as it relates to the question of labor. When farmers imagine a future countryside lacking an available workforce, whether due to immigration laws or a bustling economy (i.e. low unemployment rates), and make investments in anticipation of that future, it helps enact the countryside in that image. It helps makes real a rurality lacking an available workforce, as those laborers become displaced to metropolitan areas and rural amenity destinations where underskilled (e.g. immigrant) labor provide needed flexibility to accommodate shifting demands across sectors like construction, cleaning, and food service (Nelson, Nelson, and Trautman 2014). It also helps make real a countryside lacking migrant/immigrant labor due to enacted ambivalence as populations that once wanted and lobbied for those bodies stop doing so; as I discovered, they might even switch positions and fight to keep those laborers out of the market entirely.

Interviews with laborers brought this futured-present to the discursive surface, as many talked about what-if scenarios surrounding automation – i.e. *what-if* automation in agriculture became the norm? For the non-resident laborers interviewed, all mentioned the possibility of abandoning the agriculture sector: e.g.,

> Even with my H-2B'—the temporary seasonal workers' visa—'I probably won't be doing this [agricultural labor] much longer. Too much of a hassle, and harassment. […] I'll probably look for construction work'. (Antonio, Laborer)

The following respondent, Manuel, from Nicaragua, talked about being from a family of migrant farm laborers – his father and grandfather traveled up and down the West Cost, from California to Washington State, working fields. While able to speak English well, he admitted that it has become harder to find farm work, particularly, in his words, 'out West' – a reference to California and its fruit, vegetable, and dairy sectors – 'where they're using robots to replace people like me.' So he migrated to the Midwest.

Domestic workers interviewed discussed such what-if scenarios in the context of possibly leaving rural communities dependent upon agriculture for those with more diverse economies. To quote one such individual:

> I'm too old to go back to school and retool; to become some sort of computer tech[nician]. […] I could see leaving [this county] for one that isn't all about farming, where a guy could land a good paying construction job, or even some landscaping work. (Billy, Laborer)

Performative elements came through especially clear in my interviews with the largest growers, those with revenue in excess of US$5 million, who were contractually connected to fruit and vegetable firms. These industries are especially dependent upon immigrant labor and as such have been historically among the most powerful voices in the pro-immigrant lobby (see e.g. Bunge, Haddon, and Morath 2017). Driven in no small part by the anticipation of closed-boarders between the U.S. and Mexico, large fruit and vegetable firms are investing heavily in robotic R&D, as evidence by, for instance, Driscoll's expenditures in this space. Driscoll's controls roughly a third of the entire U.S. berry market, which includes commanding nearing two-thirds of the organic strawberry market (Goodyear 2017). They make no secret of wanting to someday fully automate their strawberry production process (McEwan 2018).

And yet, respondents from this group admitted that the political pressure that has come from this sector historically, in support of immigration, may well disappear once robotics become a fixture on its farms. A few respondents even believed robotics would lead to some companies, namely, first movers/innovators, to flip positions and begin arguing *against* porous borders and worker visas. To quote one such grower who contracts with a major food firm:

> [His employer/large fruit company] has thrown its weight around in the [immigration] debate. They need those workers. […] I can see that changing in the future. Once they develop a robotic fix [to the labor problem] they're not going to be as dependent on part-time immigrant labor. When that happens, I'm sure they'll stop spending money fighting that fight. Hell, I could imagine [his employer/large fruit company] taking the *opposite* position, arguing against open borders. With a total substitute for labor on hand, before competitors have it, it would work in their favor to choke off the flow of immigrants into the country. […] It would give them a competitive advantage having an army of robots while others are still dependent on human labor. (Peter, Farmer)

The owners of the water knife bot, from the paper's beginning, referred to their investment as 'yet another step toward weaning ourselves from Mexico' – a reference to the country's historically reliable, inexpensive labor. One made the following confession, which reflects a curious theory of agri-energy fictional expectations that would be worthy to explore further in future research:

> Immigration has been too partisan [of an issue in the U.S.]. I'm happy to invest in capital substitutions. Cheap oil is bipartisan. When it comes down to it, no President wants to see crude at over $100 a barrel.

As I write these words (early-December, 2019), 'Yellow Jacket' protests have paralyzed Paris and threated Macron's government. Ostensibly at least (the actual reasons are multiple), this unrest is said to have started because of a wildly unpopular gasoline tax that the French President quickly backed away from (Rossie 2018). It is worth exploring in future research if in addition to anticipating labor market shortages users are also betting that future U.S. Presidents (and other world leaders) will bilaterally fight to keep the fuel and/or electricity powering these machines cheap and readily available.

Futured-presents of farm demographics weighed heavily on farmers in still other ways, especially when contemplating the incorporation of robotics into their operation. The average age among U.S. farmers, which is currently just below 60 years, is increasing. Operators 65 years and older are the fastest growing population (Obudzinski 2016). Rather than

believing such tends are unsustainable, suggesting a massive transfer of land and farms in the not-too-distant future as aging farmers transition out of agriculture, a number of respondents viewed the average farmer age as having no discernable endpoint thanks to automation.

The following comment is from Jack, a dairy farmer in his early-70s who recently installed a robotic milker in his barn. 'You can't do three-a-days at my age' – a reference to milking three times a day. He continued,

> Now I'll never have to be around for another milking again. I don't even need to be on my farm. I can control it all from my phone; and even look at what's going on [thanks to cameras in the barn that can be viewed on his phone]. The cows will get milked. No one needs to be there anymore. […] Heck, I don't see why I can't keep farming for another 20 years!

Then there was my interview with Bart, who was also in his 70s. He raised hogs and grew row crops, mostly, corn and soybeans. As he explained, 'My animals are all in buildings that are climate controlled, all by a computer. From my office I can program temperature, ventilation rates, lighting, misting systems, even when the radio goes off and on for my guys' – a reference to his hired hands.

He also had what he called a 'fleet of spray drones'. This equipment was used to substitute for the hiring out for crop dusting applications. Crop-dusting in the Midwest, I was told, costs anywhere between US$10 and US$20 an acre. It is not a huge expense. (Though I realize that adds up quickly if one's operation stretches across the horizon.) Yet as Bart reminded me, 'the applications are inefficient and non-optimal'. He continued, 'My drones outperform the most experienced duster' – a reference to crop-dusting pilots – 'because they maintain a steady distance from crops and a steady speed to ensure an even coverage.'

The reason for these recent investments, Bart admitted, rested in his hips. 'I just can't get around anymore like I used to,' he confessed. He then added with a big grin that 'the only way I'll be farming in another ten years is if I can find a way to do it sitting down.' Yet he was not joking. He told me that he was 'seriously considering' looking to invest in a fully automated tractor that would allow him to plant and spray from the comfort of his home. In his words, 'I can ride in a tractor. It's getting *into* the tractor that gives me problems. If I can stay at home and plant I will.'

When asked how long he thought he would continue farming, he admitted, 'I'd do it until I'm 100 if I can. And thanks to these gadgets' – referring to automation innovations '– I just might be able to.'

## Decenter the 'bot': *dispositif* and political ontologies

Automation can elicit two wildly opposing (future-oriented) views about labor in the literature. Some reduce these platforms to jobs *lost* (e.g. Attewell 1987; Braverman 1998 [1974]; Nica 2016). Others, noting that someone has to manufacture, install, and repair these machines, emphasize jobs *gained* because of automation (e.g. McKinsey Global Institute 2017). Indeed, it is a fairly standard argument in economics that technology creates more jobs than it destroys over time (Allen 2015). It is also commonly argued that technological change is skill-biased, as lower skilled jobs are replaced by higher skilled, higher

paying opportunities (Fernandez 2001). The spatial location of labor, however, unquestionably shifts as a result of this transition, which we have seen as jobs have left the rural-based sectors of agriculture, manufacturing, and mining and been replaced by metropolitan-located employment in business, technology and financial services (McKinsey Global Institute 2017).

There are also reasons to question whether automation *per se* gives us sufficient analytic and conceptual clarity to have an informed conversation about who wins and losses through the process. For one thing, automation is everywhere. As such, it is not a terribly useful ontological category to organize a politics around. As French philosopher Stiegler (2017) reminds us, far from exclusively a concept tied to understanding modes of capitalist production, automation lies at the center of life itself. In his own words,

> A biological cell, for example, is a sequence of instructions and this sequence of instructions is automatic. The reproduction of life is automatic. When you have something that is not automatic, it is a mutation, which produces a monster. […] On this biological base we also have the psychological automatisms: instincts for animals, drives for human beings. Our reflexes, our reactions, are psychologically automatic. Now, you can transform the psychological automatisms. For example, to educate a child is to transform an automatic reaction into a new type of automatism, which is a social automatism. You say hello when you meet somebody, and this is an automatism. (Stiegler 2015)

His argument ought to sound familiar to social theorists, given its parallels with Bourdieu's (1977) concept of habitus. By way of practice, routine, and socialization – what Bourdieu called practical reason – we internalize, into our bodies, imaginaries, and even cognitive structures, new automations that substitute for other automations, while making sure to leave space in this process for individual variation and improvization.

Rather than focusing on 'the' object said to be doing the automation or 'the' skilled/unskilled humans impacted, greater value lies in taking a decentered position. Doing this brings into focus a host of artifacts, practices, and affectivities that are otherwise missed when arguments narrow to a binary position – robotic milker/no robotic milker, good/bad, skilled/unskilled labor, etc. – about these platforms.

Missed, for example, is the fact that such transitions are also *credential*-biased. Many with the skills to repair digital equipment are displaced from the labor market due to not having the credentials to fix these platforms thanks to intellectual property law and technology user agreements, as most repairs can only be performed by 'certified' technicians and dealers. Within this *dispositif*, therefore, certain worlds are being made to live (e.g. where farmers become increasingly *dependent* on others, for repairs and most everything else), while others are being left to die (e.g. where farmer *interdependence* is engendered as communities of practice allowing for the co-creation and co-repair of digital platforms are outlawed).

'You bet I can fix that stuff, I'm just not *supposed* to.' This quote comes from Nick. He was asked about whether he has the knowledge and equipment to repair today's robotic farm platforms. He then rattled off equipment that he has repaired, which included robotic milking systems, 'smart' tractors and drones.

Nick used to be a certified technician for a company that sells dairy robotic systems. He left the job about a year prior to being interviewed because of what he described as excessive travel, as his service territory covered three states. He now has his own diesel equipment repair business. Yet while he is 'equally comfortable tearing apart a transmission,

cracking into a tractor's hardware, or fixing a neighbor's milking robot,' he legally is not allowed to as an independent mechanic.

A few years back the farm implement company John Deere, in a letter to the U.S. Copyright Office, argued that farmers receive 'an implied license for the life of the vehicle to operate the vehicle' (as quoted in Wiens 2015). Farmers do not actually own the equipment they purchase, in other words. John Deere now requires that farmers sign a licensing agreement with every purchase. With this document, users sign away their rights to sue the company for, to quote directly from the document, 'crop loss, damage to land, damage to machines, lost profits, loss of business or loss of goodwill, loss of use of equipment […] arising from the performance or non-performance of any aspect of the software' (John Deere, nd). Farmers also promise, by signing, to only use approved service providers for future repairs (see also Carolan 2018d).

Interviewees told of similar strategies used by firms to keep users from going to someone like Nick for their 'bot' maintenance. Some farmers shared with me documentation from the sale, which had clear language about needing to return to the original dealer for all future repairs. Those from the industry/repair sample, meanwhile, emphasized how using an uncertified technician to make repairs voids the equipment's warranty.

Another non-certified repairperson, Larry, commented about how some of the diagnostic equipment are proprietary. This makes it difficult to repair certain automated agricultural systems, even with sufficient know-how. Larry described once being asked to make a repair for a friend who owned a cut flower farm. 'He was in a rush and needed one of his little rovers' – a robot that hauls flowers from one building to the next – fixed, ASAP [as soon as possible].' Immediately after hooking his computer up to the platform he realized he did not have the proper diagnostic equipment. He added, 'It was pretty obvious that what I needed could only be had by technicians with [the company that manufactured the platform]. It's a great way to keep them [farmers] coming back'.

This is all to emphasize the point that these platforms do not exist but *become*. Following this orientation, being resides in distributed assemblages that also include infrastructures (e.g. broadband capabilities, diagnostic equipment), everyday practices, entities like corporations, intellectual property regimes, policies, and discourses about what *is* and *ought* to be.

This decentered approach has been called a micropolitical articulation of digital skill, to compliment the more familiar macropolitical articulation that situates labor politics within 'discrete institutional spaces, such as trade unions, in order to agree [to] more equitable remuneration and working conditions' (Richardson and Bissell 2017, 2). A micropolitical understanding of skill, alternatively, 'evokes an understanding of skill that extends "outside" the human, such that agency might seem sometimes to concentrate 'in' the worker, and seem sometimes to be distributed beyond them' (Richardson and Bissell 2017, 2). This move also helps avoid theological narratives around technological development that view worker separation from work as a steady drumbeat, encouraging, instead, accounts that distribute agency across human and non-human stakeholders.

An example of these sometimes contrasting articulations of skill/automation can be found in the following exchange I had with a respondent from one of the farm labor organizations. Beth was careful not to cast automation *itself* as the problem. 'I don't think it's helpful when we make automation the boogeyman; it's not helpful to workers.' When asked to explain what would be helpful to workers, she pivoted to

education and government funding. In her words, 'We need to step up our game when it comes to protecting people, which isn't the same as protecting any specific job,' adding later, 'the government is taking the cheap way out, touting and supporting R&D around automation, robotics and A.I. without thinking about the social transformations that these technologies will bring forth.'

The following labor organization respondent was even blunter in his criticisms of labor politics that fail to account for these micropolitical realities. In Lyle's words, 'You have to remember that most trade unions are *trade* unions, not people unions. They have a vested interest in protecting the jobs of their members.' Pausing for effect, he then added, 'Trade unions are powerful; they could push a national conversation around education that would make workers more resilient to these shifts to the labor market but won't because that's threatening to their interests,' which is to protect specific trades.

A century ago, when large segments of the U.S. population began moving away from agriculture for the first time in the nation's history, the government invested significantly in expanding secondary education, as evidenced by requiring, for example, that all children attend. It was known as the High School Movement as it raised the rate of high school enrollment from 18 percent in 1910 to 73 percent in 1940 and made U.S. adults among the highest educated in the world (Goldin and Katz 2008). Investment continued with the 1944 G.I. Bill, which enabled millions of returning World War II veterans to obtain a tertiary education. Research on these investments has been clear that such government commitments were instrumental in making the American Dream a reality for millions and helped solidify the ideal of upward mobility in the country's collective ethos (Mettler 2005).

As Beth reminded me near the end of our interview, 'Machines could be a labor organizer's or union's best friend – new, better jobs – but that outlook would require that things change in this country.' That is certainly the outlook for many in countries that make the necessary investments in their social safety nets and for public goods, like Scandinavian nations. For an example of what I am talking about, take the following quote from Sweden's minister for employment and integration, Ylva Johansson, from a recent interview in *The New York Times*, 'In Sweden, if you ask a union leader, "Are you afraid of new technology?" they will answer, "No, I'm afraid of old technology,"' adding, 'The jobs disappear, and then we train people for new jobs. We won't protect jobs. But we will protect workers.'

The need to account for automation and skill through an understanding of distributive agency – as something that 'that extends "outside" the human' (Richardson and Bissell 2017, 2) – also better empirically reflects what is happening at the micropolitical level. I saw this repeatedly when talking with and observing farmers. According to macropolitical accounts, it might appear as though their success lies in having 'changed with the times', to quote Beatrice, the owner-operator of a dairy farm. Farmers first to adopt a new technology are routinely celebrated in the media for having 'new tech-savvy skill sets' (Opray 2017). Such a narrative also aligns well with (conventional) farmers' own accounts of what it means to be a 'good' farmer, where images of rugged individualism are hailed (Bell, Hullinger, and Brislen 2015; Carolan 2018d). Yet in this case, instead of pulling themselves up by their bootstraps they are using a proprietary app.

Alas, by respondents' own accounts, much of these tech-savvy skills amounted to knowing how to open their iPhones and reading displays off the screen. The following quote comes from Beatrice, introduced in the previous paragraph, as she describes how she engages with her robotic milker at the level of everyday life:

> Each animal has a collar around its neck, like a Fitbit for cows. This tracks the animal and lets me know specific info about it while it's being milked. I can monitor it all from my phone and make adjustments on the fly. […] Don't ask me how it works and God help me if anything breaks down or starts acting glitchy. I'll have a repair guy here in two shakes. […] My granddaughter knows more about technology then I do. […] I know enough to get by.

According to the framework articulated in this paper, Beatrice *was* tech savvy, just not in the modern sense that Latour (1993) points out to be a total fiction. Tech savviness is not a trait held 'in' any one body, including Beatrice's granddaughter. It is something afforded bodies by being connected. Yet the savviness afforded Beatrice also affords dependencies; a reality worth weighing as we make proclamations about what the future of farming, and future farmers, ought to look like.

## Conclusion: politics are political

Returning to our initial problematic, as foodscapes become increasingly digitized there is growing anxiety over what this means for farms, rural communities, and labor markets (Eastwood et al. 2017; The Economist 2016). Policy responses to this changing landscape have tended to adopt macropolitical understandings, reducing debates to jobs lost and gained and other variables that can be aggregated but that do not capture the micropolitics experienced on the ground. Moreover, conventional accounts tend to be topographical, seeing skills as contained within discrete bodies and spaces, as opposed to approaching these phenomena as topological enfoldings (Deleuze 1993). This paper seeks to invest the debate with a position that attends to the in-situ forms of enablement and constraint that make certain (futured) socio-technical *dispositifs* more real than others (Richardson and Bissell 2017).

Barry's (2002) analytic distinction between 'politics' and the 'political' is good to think with in this respect. Politics, according to this framework, is 'a set of technical practices, forms of knowledge and institutions' – a concept that overlaps considerably with Foucault's *dispositif* – while the political is 'an index of the space of disagreement' (Barry 2002, 270). I do worry about the extent to which certain anticipatory futures foreclose on alternative futures, which thus risks making them not even thinkable to say nothing of their *do*-ability. This point also helps us grasp the conceptual significance of *digital* futures over more traditional analogue ones.

As noted earlier, non-digital technology has long been part of agriculture. So what, if anything, is really new about digital technologies? The politics – per Barry's analytic – of some digital technologies is what is new.

Recall from earlier, for instance, how these platform have a politics – a *dispositif* – that includes intellectual property regimes and technology user agreements that allow firms like John Deere to effectively retain control over aspects of someone's tractor even though they just spent tens (if not hundreds) of thousands of dollars to 'buy' it. This risks sacrificing certain futures whose aim is to contest and challenge the status quo. As Carolan (2017a, 2017b, 2018b) highlights, as certain digital assemblages make repairs

illegal, acts reserved for only those sufficiently credentialized, they risk causing farmers to forget how to repair their equipment. This effectively makes unthinkable futures that would have been thinkable *and* doable a generation or two earlier.

Digital futures, especially productivist ones, also require specific public and private sector investments. It has been estimated that the 450 million acres of corn in the U.S. produces 14.4 million gigabytes of data annually, the equivalent of downloading the entire Library of Congress more than 50 times (Weis 2017). This number will only increase as more sensors are added to equipment–e.g. AGCO recently released a combine with more than 60 sensors that capture data in every second of operation (Weis 2017) – and as certain rural spaces find themselves with ever-faster download speeds. Meanwhile, certain parts of the countryside have only dialup and satellite Internet access (West and Karsten 2016), exacerbating already-existing socio-economic developmental asymmetries.

Spatial access to the (distributed) skills needed to participate in a digital labor market is also asymmetrical across the countryside. Reflecting on the fact that I live in Colorado, Nick from earlier commented about how there are 'probably some counties [in the state] where the nearest certified technician is more than hundred miles away, on the other side of a mountain pass no less!' While I cannot speak to the accuracy of this statement, 23 of the state's 64 counties have a 'frontier' designation – a federally-recognized term referring to counties with a population density of six or fewer persons per square mile. Many of these counties are in very isolated parts of the state, where road access is treacherous during winter months. To think some farmers facing a broken-down piece of (digital) equipment have not choice but to incur these sizable expenses (time as well as money, as service trips are billed with mileage included when distances are great) when a perfectly 'skilled' repair person might be next door ought to raise grave ethical concerns.

The *anti*-political character of some of these platforms is particularly pronounced when talking about labor, and immigrant labor especially. Certain digital assemblages are wildly remaking the countryside as they 'answer' the labor question – How can farms ensure a stable labor supply? – by making certain laboring bodies obsolete. This is being done, however, without any real dialogue and debate, especially in ways that involve those who would be most (negatively) impacted by these trends – i.e. unskilled labors. To think certain platforms could fundamentally alter the politics around the immigration debate, possibly flipping influential actors who for decades were in favor of immigrant labor (i.e. agrifood industry) and turning them into closed border zealots. To have that happen without any debate or real contestation – I mention this to others and most admit to missing the link entirely – is the very definition of Barry's anti-political moniker.

It is important that the performative element of these platforms, and their futured-presents, are highlighted and interrogated. These platforms are not simple responses to socio-political realities. They also *anticipate* worlds and in doing so have the potential to help make them real, like those anticipated worlds where immigrant laborers are made even more invisible and are harassed, jailed, and scapegoated even more than at present.

Against this were alternative imaginaries. Not discussed, however, and this is where additional research is needed, is how certain anticipatory imaginaries are able to have 'extension'. I am thinking of the term as it is used by Jasanoff (2015, 32), which speaks to how 'views and practices originating with individuals or small groups can acquire governing force across much wider domains than their original locations and circumstances of production'. For activists interested in enacting alternative theories of fictional

expectations – because, again, to be involves becoming-with-anticipation – further research is needed, which can help better explain how these theories take root and grow.

In closing, these discussions cannot be abstracted from the web of networks that allow these platforms to afford what they do. This means debates about robotics and digital agriculture need to be bundled with conversations about intellectual property law, education policies, government spending and the value of public goods, immigration policies, farmer and farm-worker wellbeing, social justice, and the like. We also need to be more aware of the effect that our anticipatory actions have on the worlds we enact. We cannot avoid futuring the present. We can, however, increase our (critical) sensitivity to the performative nature of what it means to anticipate.

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