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Fields of dreams: negotiating an ethanol agenda in the Midwest United States

Sean Gillon

Corn ethanol production is central in the United States' agrofuels initiatives. In this paper I discuss corn ethanol production in Iowa, USA and examine several dynamics: farmers' positions in agrofuel supply chains; struggles around the construction and operation of agrofuel refineries; the politics of ethanol production and regulation; and the ecological consequences of increased corn production. I argue that current US agrofuels production and politics reinforce longstanding and unequal political economic relationships in industrial agriculture. I also argue that the politics of US agrofuels, focused on carbon accounting for greenhouse gas reduction and energy security, privilege urban and other actors' social and ecological interests over those of rural places of production.

Keywords: agrofuels; biofuels; corn; ethanol; agriculture; Iowa; environmental governance

Introduction: an ethanol agenda in the US Midwest

Biofuel (or agrofuel¹) production has recently emerged as a phenomenon of global proportions. The effects are far-reaching and uneven. Related struggles centre around expropriation of peasant or common lands, changes in resources use practices dovetailing with failed rural development schemes, and biofuels' implications for food access and sovereignty, rural labour and livelihoods opportunities, and rapid ecological change (this collection, Runge and Senauer 2007, Naylor *et al.* 2007, McMichael 2009a, Bello 2009). Also central are questions about state policy, corporate involvement, research and capital investment strategies amidst efforts to improve energy security or reduce greenhouse gas (GHG) emissions (Hollander 2010; see Fargione *et al.* 2008, Searchinger *et al.* 2008).²

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¹The term 'agrofuels' is used to indicate that the production of fuel from biomass is often spatially and socioecologically placed in agricultural production systems. When referring to policy, I adopt the language of policy and use 'biofuels'. McMichael (2009a, 283) notes that the term biofuels is problematic when used 'as if such fuels represented life, as opposed to competition for scarce crop land, de-forestation, and so on'.

²For example, oil giant BP made a \$500 million research investment in the Universities of California, Berkeley and Illinois, Urbana-Champaign. ExxonMobil granted Stanford \$100

In the United States, the agrofuels agenda has meant a rapid increase in corn ethanol production, complete with volatile booms and busts in associated corn and energy markets.³ Incentives to increase US production levels are inscribed in a number of federal policies. Most prominent among them is the second Renewable Fuels Standard (RFS2) embedded in the 2007 Energy Independence and Security Act. The RFS2 mandates an increase in biofuel production to 36 billion gallons per year (BGY) by 2022, up from the 1.7 BGY produced in 2001. Up to 16 BGY, or 40 percent of this total, is slated to come from corn ethanol and corn currently feeds over 90 percent of US ethanol production (see Figures 1, 2 and 3). In 2007, US farmers responded to increased demand for corn ethanol and rising commodity prices by planting the largest corn acreage since 1944 (93.5 million acres, 20 percent more than 2006 levels; USDA 2010a).

Advocates argue that US biofuel production provides a means to mitigate GHG emissions, improve rural socioeconomic futures, and reduce US dependence on foreign oil. Opponents argue that the consequences of US biofuel production for food availability and sovereignty, carbon emissions and resource use allocations are negative (e.g. Steward 2007, Searchinger *et al.* 2008, Bello 2009, McMichael 2009a). Many of the early assessments of agrofuels' ecological implications are based on models with large temporal and spatial domains focusing on carbon or energy values alone (e.g. Farrell *et al.* 2006, Hill *et al.* 2006, Searchinger *et al.* 2008, Fargione *et al.* 2008). Examinations of socioeconomic consequences are also highly aggregated,

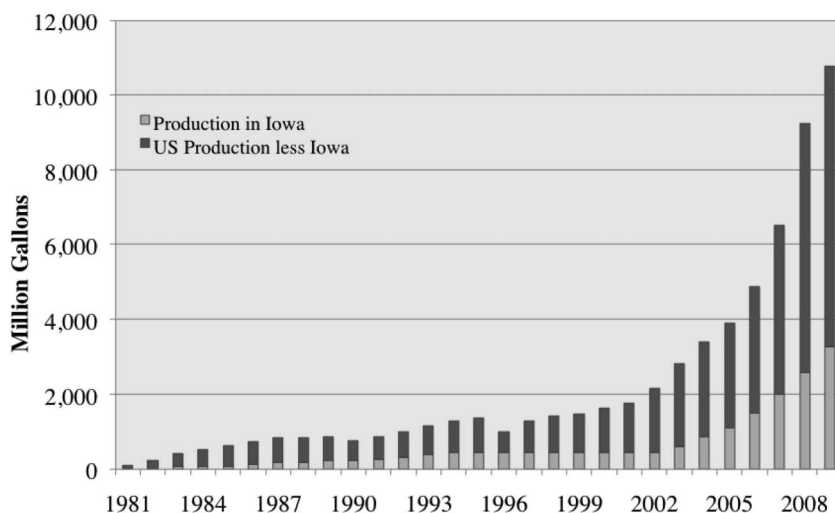


Figure 1. US and Iowa ethanol production.

Source: Renewable Fuels Association (2009) and EIA (2010), Table 10.3.

million and other oil corporations have followed suit. Valero Energy Corporation, the largest US gasoline refiner, purchased several independent ethanol plants devalued during the 2008 financial crisis.

³See Hollander (2010) on the dynamics of sugarcane ethanol in US agrofuel production, trade, and use.

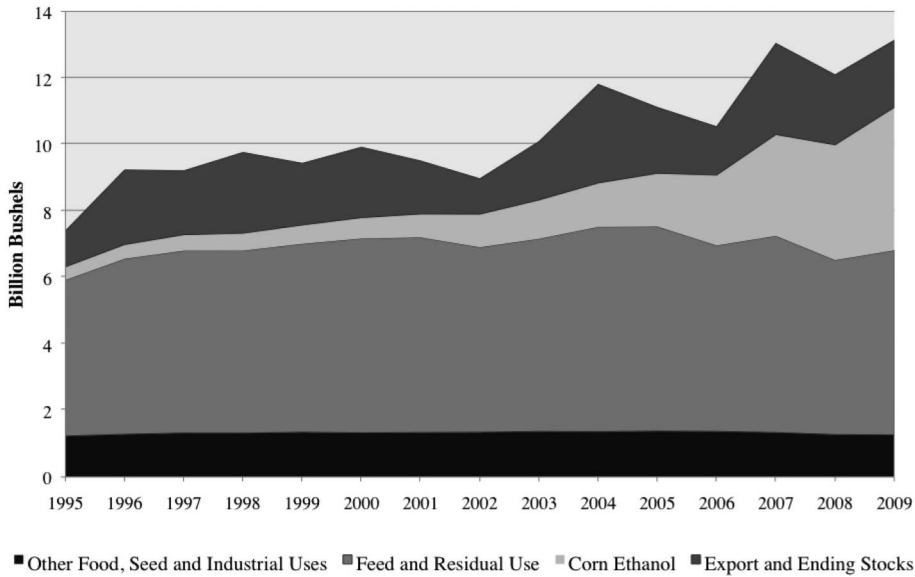


Figure 2. US corn production and use.
Source: USDA (2010b).

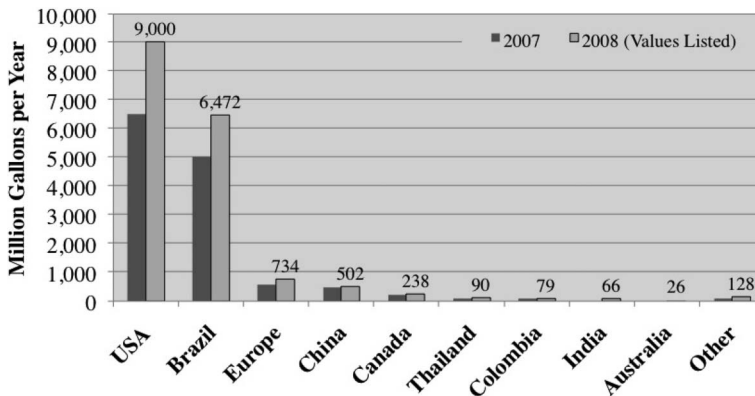


Figure 3. Global ethanol production.
Source: Renewable Fuels Association (2009), United States Department of Energy (2010).

although case-specific analyses, white papers, policy reports and other advocacy group enquiries into the global agrofuels project are beginning to emerge (e.g. this collection, Farrell 2007, Morris 2007, Widenoja 2007, Charnovitz *et al.* 2008, Jonasse 2009, Selfa 2010).

With this paper, I add texture to these debates by drawing on field research and document and policy analysis to explore the dynamics of emerging agrofuels production in the US Midwest. I aim to trace broader trends in agrofuels industry development and related politics and policies through to their linked social and ecological (socioecological) consequences in a specific place of production: Iowa, which produces more corn and more ethanol than any other US state – 20 percent

and approximately one-third of US totals, respectively (Renewable Fuels Association [RFA] 2009, USDA 2010a). The paper proceeds as follows: In the next section, I articulate a broad theoretical framework based on critical geographies of environmental governance and argue that biofuels production can be understood as an ‘environmental fix’, symptomatic of contradictory imperatives of capitalism to both exploit and conserve natural resources for accumulation. I then describe the methodological foundations of my research. Next, I draw on agrarian political economy to describe recent farm political economic change and the dynamics of biorefinery construction, operation and closure. I then discuss emerging agrofuels politics and argue that the politicisation of US agrofuels as a debate over carbon accounting for GHG reduction, energy security and consumer choice privileges urban and other actors’ socioecological interests over those of rural places of production.

Ethanol as ‘environmental fix’

As agrofuel agendas unfold and production increases, areas of intense global connection and contention emerge. Recent research suggests that the socioecological consequences of rapid agrofuel production increases are legion (see this collection). Each agrofuels controversy implies a renegotiation of social and ecological relations, whether the issue is food crises, land use change, market relationships, or struggles over industry participation and ownership. Simply stated, biofuels production, or the ‘agrofuels project’, can be understood as a socioecological project. As Harvey (1996, 182) puts it, ‘all ecological projects (and arguments) are simultaneously political-economic projects (and arguments) and vice versa. Ecological arguments are never socially neutral any more than socio-political arguments are ecologically neutral’. Recent critical geographies of environmental governance have analysed such socioecological orderings and their effects.⁴ Much of this work has explored ‘neoliberal natures’, or the practices, processes and effects of socioecological change under neoliberal forms of environmental governance. Castree (2008) argues that much of what approaches to environmental governance in a neoliberal era have in common is that they serve as ‘environmental fixes’ to capitalism’s ‘endemic problem of sustained growth’ and that the production of neoliberal nature is constituted by ‘conservation *and* its two antitheses of destroying existing and creating new biophysical resources. It is not reducible to one or other rationale alone’ (Castree 2008, 150). I argue that the US agrofuels agenda does not operate on entirely neoliberal terms, but follows Castree’s explanation of environmental governance under capitalist socioecological relations.⁵ That is, making biofuel available as automobile fuel in the face of global climate change creates a biophysical resource

⁴By ‘environmental governance’ I mean the formal and informal institutional arrangements that influence resource use and allocation, as well as mediate nature-society relations more broadly (see Lemos and Agrawal 2006 for a review).

⁵US state-led biofuel production relies on policy tools that include massive subsidies for both corn and biofuel production, tariffs levied on biofuel imports, and federally mandated production levels. These attributes apparently move US biofuel production away from neoliberal policy approaches, generally defined by government retrenchment, privatisation, devolution of responsibility, or deregulation (see Peck and Tickell 2002). Nonetheless, beyond any neoliberal moment or particular definitions of what constitutes market-based governance, agrofuels production builds on capitalist socioecological relations.

intended to reduce greenhouse gas emissions while maintaining (liquid fuels) consumption levels and accumulation based on extracting cheap corn from the Midwestern landscape.⁶ In this way, agrofuel production efforts resonate with a long line of US agricultural subsidy policies and surplus reduction strategies promoting accumulation, such as using cheap grain to feed livestock, as an input for industrial processes, and as food aid (Goodman *et al.* 1987, Friedman and McMichael 1989). Importantly, this approach to agrofuel industry development also hinders finding more equitable and effective climate change solutions, such as addressing different nations' unequal contributions to GHG emissions or improving energy conservation and access to public transportation.

In addition to strong state support, the US agrofuels project is, in part, performed through market mechanisms that allocate resources via price signals.⁷ Corn's destination as human food, automobile fuel, livestock feed, or other industrial input is decided upon through speculative investments, volatile exchange values, biofuel mandates, and other market interventions, irrespective of human need amidst generalised food crises or other socioecological concerns. Degraded rural environments are counted as externalities and rural development questions are reduced to finding efficiencies in labour and commodities markets. As McMichael (2009b, 155) puts it, the 'socially and ecologically inappropriate' agrofuels project amounts to 'the ultimate fetishisation of agriculture, converting a source of human life into an energy input at a time of rising prices'. Market-driven resource substitution (i.e. replacing gasoline with agrofuel) fits comfortably with recent approaches to environmental governance that embrace a neoliberal market episteme (see Liverman 2004, Castree 2008). Research exploring geographies of environmental governance speaks to these dynamics. Prudham (2009, 1595) argues that the development of 'green capitalism', framed as an 'environmental fix' in this analysis, is worked through social relations and that this is a contingent, qualitative problem entailing a 'dynamic confrontation, transformation, and redefinition of material social and cultural conditions'. In this paper, I explore the dynamics of these transformations in the context of US Midwestern corn ethanol production. Before turning to the politics emerging around US agrofuels production and regulation, I draw on agrarian political economy in the US context to describe how this attempt to find an environmental fix through ethanol exacerbates the negative socio-ecological consequences of industrial agriculture.

Methods

My research is methodologically informed by work in political ecology that allows for varied theoretical engagements, but often articulates in-depth fieldwork with political economic and ecological analyses across scale (Blaikie and Brookfield 1987). Political ecological research in any location often explores questions of resource access and

⁶See Huber (2009) on the value relations involved in and centrality of gasoline consumption in American culture and capitalist accumulation.

⁷A recent policy report points out that this substitution of ethanol for gasoline is very expensive. Citing US Government Accountability Office data they peg costs at \$4 billion in subsidies to replace about two percent of the US gasoline supply or \$1.95 per gallon above gasoline retail prices (Baker Institute 2010). Put alongside research demonstrating that agrofuels do not reduce GHGs (e.g. Searchinger *et al.* 2008), this high cost reveals US interests in maintaining secure sources of energy and accumulation in agro-industrial sectors.

control, the effects of integration into international markets, livelihoods issues, and state action and capacity, among others (Peet and Watts 1996). In recent years, scholars have expanded the focus of political ecology from the Global South alone to include study in the Global North under the auspices of a 'First World' political ecology. This work recognises that many of the methodological and thematic insights gained from 'Third World' political ecology can be productively employed elsewhere (e.g. McCarthy 2002, 2005, Robbins 2002, 2006, Walker 2003, Prudham 2004, 2005).

Drawing on this approach, my research integrates empirical components that include policy and document analyses; statements made by US public officials; secondary data on land use, agricultural production, and biofuel industry development; and qualitative data from field research conducted in Iowa between 2006 and 2009. Interviewees included farmers, county conservation officials, related state-level public officials, Iowa residents, industry investors, and refinery owners and operators.⁸ Semi-structured interviews with farmers, conservationists, and residents were focused in a six county area in northeastern Iowa selected for (1) high farm type diversity that allows for analysis across production strategies; (2) topographically varied landscape that makes conservation particularly important; and (3) the presence of refineries and different levels of resident engagement with the ethanol industry. I spoke with over 75 residents and farmers of varying backgrounds, regional agricultural cooperative representatives, and several refinery investors. Interviewees were identified through attendance at agriculture and conservation meetings and events, and through personal contacts. I employed a snowball sampling method to help to reveal networks among different interviewee interests and positions. Interview notes and texts were coded and analysed by theme.

A political economy of corn in ethanol

The development of the biofuel industry in the US Midwest can be understood with insights from agrarian political economy (see Buttel 2001, Bernstein 2010). Many scholars have studied the political economic dynamics of intensive agricultural production in US heartlands and the socioecological consequences of market allocation of resources in agriculture (e.g. Friedmann 1978, Goodman *et al.* 1987, Blaikie and Brookfield 1987, Lighthall and Roberts 1995, Marsden *et al.* 1996, Page 1997, Heffernan 2000, Buttel 2003). Few analyses have addressed these issues in light of developing agrofuel supply chains. This section describes how biofuel development strategies connect to rural landscapes and livelihoods through agro-industrial political economic processes.

Industries producing inputs for agriculture and processing agricultural products have been central to the functioning of farm economies, US capitalist growth and urban-rural relations in the US Midwest since the late nineteenth century (Page and Walker 1991). Research in agrarian political economy focused on agro-industrialisation describes the changing relationship between agriculture and industrial sectors (see Goodman and Watts 1994). Foundationally, Goodman *et al.* (1987) and

⁸Public officials interviewed include several county-level conservationists working with the Natural Resources Conservation Service (NRCS), the state conservationist for the NRCS, over 30 District (county level) Conservation Commissioners, the director of Iowa's Department of Natural Resources, and the director of Iowa's Office of Energy Independence. To protect interviewee anonymity I omit names and reference interview data as 'Personal Communications'. Interview locations and dates are listed.

Goodman and Redclift (1991) point out that agriculture–industry relations have changed over time to move more of supply chains into industrial sectors, contributing to farmers’ marginal position relative to agricultural input suppliers and the purchasers of farm products. Through agro-industrialisation, the authors argue, agriculture is rendered the producer of simplified industrial inputs like corn, which can be reconfigured in myriad ways to become highly processed food products, animal feed, or fuel. Viewed through this lens, agriculture is a source of accumulation for industrial sectors adding value to simple, cheap agricultural products in order to profitably provide low-cost goods for urban populations, much like ethanol is meant to be a cheaper, if not a more renewable, alternative to gasoline.

Goodman *et al.* (1987) and other authors argue that these relationships mean less profit and stability and more risk in a given supply chain falls on the farm relative to the industrial sector (see FitzSimmons 1986, 1990). This is due to the farm’s asymmetrical vulnerability to variation in the biophysical conditions of production and market fluctuations, felt more sharply by farms due to their marginal position in terms of market power and control. Drawing on this literature, I analyse developments in US Midwestern agrofuel production in the two sections that follow – one focused on biorefineries and a second focused on farm dynamics. I show that federal biofuel policy, volatile markets, and circuits of agro-industrial capital exchange and investment offer limited lasting rural economic opportunities and reproduce the same political economic marginalisation and negative ecological consequences characteristic of intensive agricultural production in the US Midwest.

Biorefineries

Biorefineries constructed to transform corn into automobile fuel are central in US Midwestern agrofuels production. Although begun decades ago by farmers’ cooperatives as a strategy to diversify product markets and increase self-reliance, recent federal biofuel production mandates and incentives have dramatically increased US ethanol production and the number of biorefineries in operation. In 2000 there were 54 US biofuels refineries producing 1.6 billion gallons per year (BGY) (RFA 2009). In 2009, 193 refineries produced 12.4 BGY and the completion of 20 plants under construction will add over two BGY in capacity (RFA 2009). Iowa ethanol production nearly doubled to 859 MGY between 2002 and 2004, again by 2006 (to 1.5 BGY), and yet again in 2009 (to well over 3 BGY) (RFA 2009). Today, the 38 ethanol and 14 biodiesel refineries located in Iowa can produce 3.42 billion gallons of biofuels annually. Including capacity planned for construction or expansion brings Iowa’s total biofuel production to 3.8 BGY, nearly one-third of the domestic supply (RFA 2009). Federal policies support refineries with research and development dollars, loan guarantees and other incentives for infrastructure development. This is in addition to production level mandates, tariffs on biofuels imports, and tax credits for biofuels blenders (largely oil companies). State-level policies vary in their standards and means for increasing ethanol production and consumption, but the strongest incentives flow from the federal level.

The cost of refinery construction is often paid with funds both internal and external to the refinery’s location. During boom time, capital costs for a 100 million gallon per year (MGY) ethanol refinery were roughly \$135.7 million – the production level at which economies of scale are generally realised for machinery,

operational, and transport costs (Farrell 2007). As the biofuels industry picked up speed in Iowa, farmers and community members gathered in local hotels, high school gymnasiums and other public venues to hear ethanol refineries pitched as investment opportunities. Prospective builders included existing agribusinesses, farmer co-operatives and start-up companies financed with venture capital from within and outside the state. Residents at these meetings were asked to support local refinery construction with capital investments of varying magnitude. In many cases the minimum hovered around \$5,000 and sometimes reached \$25,000.

In some cases, farmers and recipient communities were eager to invest in the quickly emerging agrofuels industry. A policy analysis drawing on an Iowa State University study placed a farmer's five-year return on investment in a local refinery at an average of 23 percent, while farmers in 70 percent of Iowa's counties can expect to earn an average of only 2.5 percent on their investment in agricultural land – although this says nothing of the risk of decreased returns due to volatile market conditions (Morris 2007). My interviews with Iowa residents, ethanol refinery operators and investors reflected the excitement of some for new economic opportunity. Several northeastern Iowa farmers and ethanol boosters told of a capital drive for \$30 million dollars ending after just seven hours – one person involved said, 'that's how long it took people to write \$30 million worth of checks'. A capital fundraiser for ethanol plants boasted that after sitting down with six or seven farmers in a coffee shop for less than hour he was able to entice them enough to walk away with \$700,000 in cheques (Personal communication, 15 July 2009, Iowa City, Iowa). One woman, a major partner in a cooperatively owned Iowa refinery, told me that while her family was tired of hearing her preach the 'good news of ethanol', they weren't fatigued by 'the dividend checks coming in at Christmas time' (Personal communication, 16 August 2007, Underwood, Iowa).

As market conditions for ethanol production changed many northeastern Iowa residents interviewed expressed scepticism that biorefinery investments were either personally financially profitable or good for their local economy. Excitement about investment and rural economic development opportunities was tempered by knowledge of ethanol production's dependence on favourable corn and oil markets. The volatility in these markets was well understood by interviewees whose livelihoods depend on them. In 2005, corn prices hovered around \$2.00 a bushel (56 *pounds* of corn). Through 2007, per bushel prices were in the \$3.00 range. In 2008, prior to a global commodities price crash, average corn prices reached \$5.50/bushel or more and then peaked in June 2008 at record highs of over \$7.00/bushel. As corn prices climbed, ethanol producers found it more difficult to make the agrofuel pay, especially as the biorefinery boom's surplus of ethanol drove its price down. When oil prices fell after the 2008 financial crisis, ethanol was even less competitive with gasoline; and corn prices did not drop enough during the market crash to significantly improve ethanol's profitability.

By November 2008, approximately 10 companies shut down 24 plants nationwide, despite huge federal subsidies (Krauss 2009). The Renewable Fuels Association estimates that after commodity price crashes in fall 2008, US biorefineries were operating two BGY, or near 20 percent under total capacity (RFA 2009). In 2007, one University of Nebraska study pointed out that smaller or locally owned refineries would likely go out of business before larger, absentee owned refineries with significant capital backing and economies of scale in corn to ethanol conversion (Peters 2007). Many that are no longer in operation or were idled or sold off were

owned by cooperatives or built with large percentages of local capital between 2005 and 2006. In 2005 near 46 percent of national ethanol refineries were cooperatively or farmer-owned (EPA 2006). On the heels of rapid industry growth and contraction, less than 23 percent of refineries are cooperatively or farmer-owned and only one of the 20 slated for construction is locally owned – some have closed, others were absorbed by larger companies, and those remaining control a diminishing percentage of national ethanol output (RFA 2009).

In northeastern Iowa, ethanol refinery controversy revolved around a plant located in the small town of Dyersville. The plant was built in September 2008 and owned by VeraSun, an independent South Dakota company that once competed with long time grain merchant and agribusiness giant Archer Daniels Midland (ADM) for the top spot in ethanol production. With incredible speed VeraSun nearly doubled its ethanol production interests to \$1.2 billion and 1.635 BGY worth of production in 2008, surpassing ADM's 1.07 BGY production capacity, which accounted for 20 percent of the market share in 2006. In October 2008, VeraSun filed for bankruptcy after losing over \$476 million in one quarter. This loss was connected to making bad bets on prices for long-term corn contracts – VeraSun signed up to pay high prices for corn in summer 2008, after Iowa floods threatened corn supplies and before commodity prices crashed. After the commodity price crash VeraSun refineries shut down, along with other Midwestern refineries sitting idle amidst fields of corn or operating at less than total capacity. Valero Renewable Fuels, part of the US's largest oil refiner, Valero Energy Corporation based in San Antonio, Texas, purchased seven of VeraSun's idle refineries for \$477 million – far less than construction costs that likely totalled in excess of \$1 billion.

The Dyersville VeraSun plant, located just blocks away from the set of the 1989 movie 'Field of Dreams', shut down just two months after opening. Valero did not purchase this plant and residents were concerned about corn market volatility and the approximately 50 jobs gained and quickly lost by the plant's closure (Personal communications, Porter 2008a, 2008b, 2009). Interviewees were hopeful that commodity markets would stabilise, but wary of agriculture's boom and bust cycles and the challenges of capturing benefits from regional agricultural product processing industries (Personal communications, 2008, Delaware, Dubuque, and Jackson Counties, Iowa). One story I was frequently told is telling and cautionary. Several farmers and residents described regional residents investing hundreds of thousands of dollars in a biofuel start-up company promising high returns on investments. Soon after writing cheques, industry profitability problems emerged and their broker fled to Florida, cash in hand. Dyersville, Iowa farmers' and residents' uneasiness about potential ethanol futures was warranted. Although significant numbers of residents opposed the construction of the VeraSun refinery, plans went ahead. During VeraSun's bankruptcy local news media reported the refinery's efforts to undermine commitments made to farmers. Two weeks after filing for bankruptcy, VeraSun petitioned a bankruptcy court judge for the right to reject contracts to buy area farmers' corn. Four days later the plant shut down. Here, I quote a 16 November 2008 article in the local newspaper at length (Porter 2008a):

... [VeraSun] issued a statement saying that farmers who delivered corn before Oct. 11 [2008] might not promptly receive payment. Finally, several area producers say they received a check from the company. An accompanying note said if farmers endorsed the check, they agreed to receive market cost for the corn instead of the agreed contract price. 'That means I'm not going to get as much as I thought,' said Dick Recker, of

Dyersville. He started selling corn to the VeraSun plant in July for about \$7 per bushel. He entered into another contract to deliver grain in July 2009, but a recent conversation with a VeraSun representative left him discouraged. 'The price might have to be negotiated at the time of delivery,' Recker said. 'He said if corn went back up close to what we got a contract for, then we'd be OK, but if market price is \$4, then he said we'd have to talk about it.' With the Chicago Board of Trade closing Friday at \$3.80 per bushel, Recker knows the future looks dim. By cutting the price per bushel in half, he could be out more than \$40,000 next year.

... 'Well, I would have to say, it's almost like, "I told you so,"' said Becky Schwendinger. She lives on the west end of Dyersville, close to the plant and opposed its construction from the beginning. 'It was rushed through,' she said. 'The city didn't care that we had 600 signatures opposing it. That meant nothing to them.' Another neighbor to the plant, Marty Steffen, who lives less than a mile from the facility, said the plant promised an economic boost and is failing to deliver. 'My thought is that the light at the end of the tunnel isn't as bright as was originally portrayed,' he said. 'Don't get me wrong, I want this town to prosper. I want the farmers to prosper, but in one sense, Dyersville put all its eggs in one basket.'

Fuel from the farm

Corn ethanol production's profitability depends on extracting cheap corn from the Midwestern landscape. This is a proposition made possible by federal subsidies, asymmetrical market relationships, and vast acreages of farming operations designed to maximise productivity with fossil-fuel based inputs, massive labour-reducing machinery, and high-yielding seeds.⁹ After passage of the Energy Policy Act of 2005 (EPACT 2005), the source of the first Renewable Fuels Standard mandating increased biofuels production, corn demand, prices received, and production levels steadily increased.

A survey of media coverage of the 'dot corn' boom, marked by the volatile corn prices describe above, revealed contradictory descriptions of newly minted million-aire farmers alongside those who were nervously waiting for the bubble to pop. One Iowa farmer stated, 'It seems like a farmer gets one or two homeruns in his career. Is this our homerun? I think so' (Paulson 2007). Other Iowa corn growers feared the bust, saying 'I don't want to get caught up in the euphoria' (Etter 2007). Speaking to a reporter who asked about the benefits of rising commodity prices a nearby Minnesota corn grower said, 'Four-dollar corn is a bad thing – write that down' (Birger 2007). Corn ethanol production level mandates acted to maintain corn demand and prices, for a time. Supplies continued to increase as farmers were incentivised to produce full steam ahead until late 2008 when commodity prices began a sharp drop.

My research in Iowa followed these dynamics and showed that despite a period of strong crop prices, farmers failed to reap large profits.¹⁰ Sharply rising input costs

⁹Monsanto now offers a 'Processor Preferred' corn seed line bred for higher starch content to increase the efficiency of its conversion to ethanol.

¹⁰Even though considered a 'propertied class' in agrarian political economy, US farmers are subject to marginalisation in a competitive, capitalist agriculture (Davis 1980). Scholars in agrarian political economy have described the risks that farmers confront when facing the vagaries of commodity markets, land values, and loan rates: farmers, hoping to reap profits from high crop prices often take out loans to plant more acres or invest in new storage or planting and harvesting capacity. They hope their investment will bring a rate of return sufficient to cover the cost of the loan and that commodity markets will stay strong enough to

were one primary reason. Nitrogen fertilizer and lime prices jumped 26 percent or more between 2006 and 2007 and continued to rise through fall 2008 (USDA 2008a, Westhoff *et al.* 2008). During summer 2009, farmers described barges of prohibitively expensive nitrogen fertilizer parked along the banks of the Mississippi – dealers couldn't find farmers to buy fertilizer priced at 2008 levels. Iowa cropland values went up an average of 19 percent between 2007 and 2008 and contributed to reduced profit margins for renters (USDA 2008b). Almost without exception, farmers interviewed described competitive dynamics in cropland rental markets and complained of local and absentee landowners raising rents and then renting to larger farms that could afford the increased rates. One farmer described rising production costs and the re-investment imperative commonly referred to as the technological or production treadmill (see Cochrane 1979). 'You have to be running pretty fast just to stay in place' he said, with frustration evident, and went on, 'We just need to figure out a way to keep people from trying to farm the whole damn world' (Personal communication, 15 August 2007, Dubuque County, Iowa). A USDA representative, sympathising with farmers watching rising crop prices go to increased input costs, said, 'If your making it on this end, they'll be getting it on the other' (Personal communication, August 2007, Maquoketa, Iowa). Another farmer interviewed said simply, 'They keep 'er spent' (Personal communication, 15 August 2007, Epworth, Iowa). Others interviewed expressed similar sentiments of hope for livelihoods improvement, tempered by their knowledge of competition and volatility in agricultural markets beyond their control. For example, a corn farmer said of the ethanol boom, 'I made more money on \$2.00 corn ... the price of land went up, the price of inputs went up ... there's less profit in an acre of corn now than there was five years ago. I can show you my books' (Personal communication, 27 June 2009, Bellevue, Iowa).

Corn farmers are one type of farmer among many. Despite simplistic assertions that rural benefits will arrive on the heels of an ethanol industry, the risks, costs and opportunities associated with biofuels industry development fall unevenly. Livestock farmers, who depend on grain that they produce and purchase for animal feed told a different and more brazenly oppositional story, encapsulated by this comment from the head of the National Cattlemen's Beef Association: 'This ethanol binge is insane ... This talk about energy independence and wrapping yourself in the flag and singing God Bless America – all that's going to come at a severe cost to another part of the economy' (Herbst 2007). In 2007, Texas Governor Rick Perry asked the US Environmental Protection Agency (EPA), the agency charged with Renewable Fuels Standard implementation, to reduce ethanol use requirements in order to ease the upward pressure on feed prices in support of the livestock industry and to reduce food prices generally. The EPA did not acquiesce.

In Iowa, independent hog farmers happy to have resisted a tide of vertical integration sweeping over increasingly 'inefficient' independent operations expressed their continual frustration by unpredictable and unfavourable feed and meat markets and the related erosion of their control over the supply chain. Many of these trends, they felt, were exacerbated by the ethanol industry. Iowa's long history of battles between independent livestock farms producing in stiff competition with

allow loan repayment before increased productivity or more generalised price declines drive down crop commodity prices. If falling prices and land values make it impossible for farmers to repay loans, they default and face foreclosure (cf. Buttel 1989).

vertically integrated operations makes this a particularly heated subject among Iowa farmers (see Page 1997). For example, members of an agricultural cooperative I interviewed expressed anxiousness about the reconfiguration of regional corn markets. As refinery construction picked up pace cooperative members cited increasingly larger corn purchasers entering the market as intermediaries supplying ethanol refineries. Cooperative directors worried about their ability to source feed to sell to their long-time livestock-producing customers. One hog grower I interviewed complained that the local ethanol plant had made his job a 'break-even proposition' (Personal communication, Dubuque County, Iowa, 15 August 2007).

Interviews with Iowa farmers revealed that relatively few benefits of the ethanol gold rush were coming their way. Rising input prices and land rents slimmed the profits accruing to Iowa agricultural producers with particularly negative effects on the livestock sector. These findings echo research in agrarian political economy demonstrating farmers' relatively marginal position with respect to others in the industry, such as the input manufacturers and commodity processors discussed above. The politics of the proposal to improve global ecological outcomes (i.e. GHG reduction) through agrofuels production should not be missed. Following Harvey (1996, 184), 'One path towards consolidation of a particular set of social relations, therefore, is to undertake an ecological transformation which requires the reproduction of those social relations in order to sustain it.' In the case of US Midwestern corn ethanol production, agrofuels mandates may serve to reinforce social relations in systems of intensive agricultural production. Specifically, as research in agrarian political economy has noted in the past, corn ethanol production may concentrate risk on farmers relative to other actors in the corn (ethanol) commodity supply chain.

Politicising US agrofuels

Beside the difficulties farmers face in capturing ethanol related profits due to their position in agro-industrial economies, rural communities negotiate an agrofuels future that promises economic opportunity and energy independence at a price that some residents do not wish to pay. While many distant from the places of production hope to reduce automobiles' contribution to climate change or bolster national energy security through agrofuel production, rural spaces are expected to pin hopes on productivist agriculture and refinery construction that often leaves communities at serious risk of financial and ecological loss. Understanding how rural social and ecological relations are renegotiated vis-à-vis an ethanol agenda requires attention to the politics and practices of environmental governance that produce related discourse and influence material outcomes (see Himley 2008).

As US Midwestern agriculture is increasingly involved in energy production and carbon sequestration efforts it becomes necessary to engage with its connections to carbon accounting strategies, fuel supply chains, agrofuels investors and policies, and changing global agricultural landscapes (Hollander 2010, cf. Tsing 2005). In what follows, I engage the politics of agrofuel production and ask, for whom or what are agrofuels produced? This analysis helps to reveal the contested nature of agrofuels production and use as a part of environmental governance. First, I draw attention to how agrofuels production in the US has been politicised through lifecycle analyses (LCAs), which measure the carbon and energy costs and benefits of particular agrofuels. While carbon accounting is surely important in addressing

climate change, I suggest that politics narrowly framed around debating the accuracy of LCAs do little to address the social and ecological consequences of agrofuel production.

Carbon accounting

Agrofuels have received the most attention in US policy debates as a means to reduce oil consumption and GHG emissions. For agrofuel production to qualify as a *legitimate* 'environmental fix', particular agrofuels' GHG emissions must register below those of gasoline. Consequently, as federal support for US agrofuels production increased under production mandates, opponents and proponents alike quickly produced and refined models to calculate the carbon and energy balances of various production strategies. Results continue to vary widely. Modellers' different decisions about the production requirements (i.e. the amount of nitrogen fertilizer needed per acre or corn processing procedures), energy credits for the by-products of ethanol production (i.e. distillers' dried grains fed to cattle), and where to draw the temporal and spatial boundaries around these systems contribute to the discrepancies. For example, Pimentel (2003) includes the energy costs required to power human labour in the form of a farmer's food, whereas others do not. In a USDA-sponsored study, Shapouri *et al.* (2002) calculate that the energy required for corn and ethanol production has decreased 19 percent since the 1970s, due to increased efficiencies in corn production and ethanol refining. Conversely, Pimentel (2003) finds that ethanol production requires 29 percent more energy than it returns. Patzek *et al.* (2005) argue that one gallon of gasoline is required to produce 1.5 gallons of corn ethanol and that when burned they yield equivalent amounts of carbon dioxide. Hill *et al.* (2006) demonstrate that the GHG reductions of corn ethanol and soy diesel were 12 percent and 41 percent, respectively, when compared to their fossil fuel counterparts. They also find that ethanol production yields 25 percent more energy than required to produce it; soy diesel was pegged at 93 percent, largely due to its lower nitrogen fertilizer requirements. Farrell *et al.* (2006) attempt to reconcile various corn ethanol energy and GHG balance calculations by equalising modelling assumptions. Their best estimates, admittedly uncertain, are that ethanol reduces petroleum use by 95 percent and GHG emissions by 13 percent when compared to the production of an energetically equivalent amount of gasoline. None of these analyses included the carbon costs of land use change.

As negotiations over the future of ethanol production heated up in public discourse, these lifecycle analyses were constructed and put forward in increasingly complicated and comprehensive arrangements. Notably, Searchinger *et al.* (2008) and Fargione *et al.* (2008) argued that previous analyses of agrofuels' net energy accounting were inaccurate and ultimately fatally flawed due to their omission of the carbon costs of indirect land use change associated with increased agrofuel production. The two papers, published in *Science*, argued that increasing US agrofuel production raised global grain demand and commodity prices, provoking increased agricultural production abroad – the acreage for which, the models said, could come from land conversion in Brazil and put pressure on rainforests (Searchinger *et al.* 2008).

Consequently, the EPA, the US agency responsible for administering and analysing the impact of the Renewable Fuels Standard (RFS), amended their carbon calculations when overseeing the second RFS (RFS2). In their first draft analysis of

the RFS2, released in May 2009 with new carbon accounting strategies that included carbon dioxide emitted from indirect land use change, the EPA found that neither corn ethanol nor soy biodiesel made their requirement to qualify as a 'renewable fuel'. To qualify, corn ethanol needed to reduce GHG emissions by at least 20 percent compared to gasoline; the EPA found it reduced emissions by only 16 percent (EPA 2009).

The industry's response to the threat the EPA posed them was overwhelming. The Renewable Fuels Association submitted a letter to the EPA expressing its 'grave concern'. The RFA suggested that the documentation and data EPA provided about their model determining indirect land use changes' carbon costs were 'wholly insufficient' and the EPA's science was targeted for attack (Dinneen 2009).¹¹ State politicians mounted a case against the EPA's science through the Governors' BioFuels Coalition. Iowa's representative to the coalition was Iowa Office of Energy Independence Director, Roy Stanley, who said, 'It is important that the numbers are right and that they stand up to really open, solid analytical scrutiny ... and I think at this point we're a little concerned that we've only seen little snippets and a lot of the modeling seems to be, you know, behind the curtains, which always makes one uneasy' (Personal communication, 17 August 2009, Des Moines, Iowa). She went on to describe the potential of saddling oil production with a higher carbon debt as oil gets more difficult to find and refine into gasoline, such as is the case with the tar sands of Canada, which take significant amounts of fossil fuel to render useful through refining. A higher carbon cost for gasoline would make corn ethanol's relative energy and carbon balances more attractive as a GHG-reducing renewable. Other agrofuel advocates argued that EPA lifecycle analyses ought to be changed to account for the energy saved by reducing military conflicts over oil, to say nothing of the consequences for human lives (Liska and Perrin 2009).

Since this carbon controversy erupted, the EPA revised its lifecycle analyses, finding that corn ethanol qualifies as renewable fuel by reducing GHG emission by more than 20 percent compared to gasoline. Specifically, the EPA found corn ethanol to reduce GHGs by 21 percent relative to gasoline and cited improvements in refining technology, new calculations for the energy benefits of using ethanol by-products as feed, more accurate land use change modelling, and hopes for higher corn yields. This politics of carbon accounting included little discussion of the consequences of ethanol production *in place*. While the scientific assessment of ethanol changes, the socioecological conditions of its production do not. In these debates only carbon cycles and energy balances register – humans and other parts of non-human nature do not. No attention is paid to political economic dynamics, or human needs and distributional questions, such as agrofuels' influence on global food access (see Bello 2009). The epistemological stance that registers nature as

¹¹In another example, the RFA argued the following to California's Air Resources Board when it similarly moved to exclude corn ethanol from state-level biofuel production targets based on its indirect land use change implications: 'The current scientific and economic understanding of indirect land use change is significantly limited and the existing body of research on the subject is largely biased by ideology and lacks supportive empirical data. We believe the burden of proof is on those who suggest expanded biofuels production in the US will cause indirect land use change. So far, there has been no defensible, indisputable proof linking biofuels to indirect land use change' (Cooper 2009). To date, it seems that Midwestern corn ethanol will not qualify for California's Low Carbon Fuel Standard.

carbon alone also misses ecological relations not so quickly reducible to GHGs, like the ecological change in places of production described below.

Ethanol for what?

While some proponents of US agrofuel production cite its potential to generate benefits for depressed rural agricultural economies, agrofuels are more often discussed as a method for GHG reduction or means to secure the US's energy future (see Urbanchuk 2009, Charles *et al.* 2007 for examples of the former). Mol (2007) points out that biofuels' GHG benefits may be more representative of urban or cosmopolitan populations' desires for cheap energy or an opportunity to mitigate climate change than the interests of rural inhabitants likely to bear most of the ecological costs of biofuels production. In this section, I develop this argument, adding another dimension to the discussion of how agrofuels are politicised in public debates. I show how global interests in reducing GHG emissions or (sub)urban interests in reduced (automobile) pollution or gas prices may trump, both discursively and materially, the negative socioecological change occurring in rural places of production.

Signalling the urban-rural politics at play, Minnesota representative Gilbert Gutknecht, in a US House of Representatives' meeting on the role of agriculture in renewable fuels production, said this: 'we have got to begin to expand this debate. Because the people who found the argument [for biofuels] interesting it seems to me, were not necessarily farmers, it was people living in suburban communities. They want cheaper energy. They want a cleaner environment. They want all the things that renewable energy can bring' (US House of Representatives 2005, 6). Echoing these sentiments, a Natural Resources Defense Council (NRDC) spokesperson asserted, 'The only reason the environmental community is interested in biofuels is as a way to address global warming' (NRDC 2008). Pointing to a narrow conception of biofuels' intended benefits, an NRDC report stated that biofuel production is an effort to supply 'meaningful choices at the pump for consumers' (NRDC 2008). As Richard Lugar, Republican senator from Indiana put it, ethanol's critics ought to recognise that 'we are talking about the ability of our country to continue on the lifestyle to which we are accustomed' (Truitt 2007). Unfortunately, that may be the problem, exactly.

Even if consumers do not buy agrofuels for their putative GHG-reducing capacity, some may be persuaded that US agrofuels purchasing can reduce US dependence on foreign oil and US contributions to 'rogue nations'. Take, for example, this statement on biofuels' benefits by Al Hubbard, economic advisor to former US President George W. Bush: 'Not only would we all pay less for gasoline, but more important, Venezuela and Iran would no longer be making the kind of money they are today to fund our enemies' (Brasher 2007). Nonetheless, if all US corn production went to ethanol production it would replace *only 12 percent* of US gasoline consumption – a generous estimate by most accounts (Runge and Senauer 2007, Westcott 2007). The EPA (2010) estimates that if current US biofuel production targets are met (36 BGY by 2022, including 'advanced biofuels') they will displace a scant seven percent of US gasoline and diesel consumption. While there is nothing necessarily sinister about reducing US oil consumption or GHG emissions, this narrow framing, like the focus on carbon accounting discussed above, renders other implications of agrofuel production less visible. This approach to understanding an agrofuels agenda also implies that decisions about strategies

for environmental governance are resolvable by diversifying consumer choice in the fuel marketplace, rather than addressing US transportation or agricultural sector issues or encouraging energy conservation, for example (cf. Pye 2010, this collection).

Despite their absence in a politics of carbon accounting or consumer choice, the building of ethanol refineries and related infrastructure in rural areas means new socioecological dynamics. These include changes in markets and farm economies described above and concerns over public biorefinery investment, environmental quality and resource use, which I turn to now (see also Selfa 2010). For example, water use issues have emerged. On 11 March 2008, the *New York Times* reported that in the summer of 2006, 'a Cargill biodiesel plant in Iowa Falls, Iowa improperly disposed of 135,000 gallons of liquid oil and grease, which ran into a stream killing hundreds of fish' (Goodman 2008). Cargill was fined \$100,000. Exacerbating another longstanding water quality issue, Donner and Kucharek (2008) estimate that increases in nitrogen use for corn production will dump an additional 10–34 percent into the Mississippi River and its dead zone in the Gulf of Mexico. Air quality concerns also surfaced after the Bush administration lowered refinery emissions standards (40 CFR pt 51–71, Hunt 2007). Refineries also require large amounts of energy to ferment the starch and sugar in corn into ethanol. Natural gas pipelines are often expanded at some expense to the hosting county or town and in some cases on-site coal firing powers the refinery, with obvious implications for local air quality. Other debates over ethanol production's consequences include the costs and desirability of expanding railroad tracks to accommodate new refineries – ethanol, unlike gasoline, cannot be piped to other points of distribution or consumption. Instead, it must be carried in railcars because of its tendency to corrode pipes with its water content. Many residents I interviewed protested that their county or city should not pay to widen roads that facilitate the transportation of the 600 acres' worth of corn a refinery can consume in one day or offer such large tax abatements to attract refineries (sometimes up to 20 years without local or state taxes).

More specifically, my fieldwork in northeastern Iowa connected with debates over the desirability and costs of a building a refinery in the small town of Manchester. The discussions around its potential construction and the incentives package it drew from federal, state and local governments are worth noting. Interviews with residents and public meeting records revealed a host of issues raised by the proposed biorefinery construction: concerns about water use and air quality; questions about community members' real desire to support and become a part of the ethanol industry; the plant's location on the outskirts of town in an area zoned for commercial, not industrial, development; the conversion of Delaware county from 'livestock country' to 'ethanol country'; increased truck traffic and children's safety; and water use. One city council member who opposed the plant argued that because the company boasted its ability to pay for the \$155 million plant in 3–7 years it certainly didn't need any of the city's money. The city agreed to give the plant \$6.6 million through a ten-year property tax abatement, an extension of sewer service to the land annexed, and roadway improvements to accommodate future increases in corn truck traffic. In addition, the Iowa Department of Economic Development awarded a \$10.4 million sales and use tax credit for the approximately 50 jobs to be created by the plant. Despite protracted negotiations, the plant developers, All Fuels and Energy Company, pulled out of the deal and sold the land the city annexed for its construction. Demonstrating the fickle nature of agrofuel capitals' connection to

rural economic opportunity, the company quickly converted their investments in the community to cash, citing the benefits of having higher levels of capital liquidity in late 2008. The consequences of agrofuels development were not all positive for places of production, nor were they registered in EPA carbon accounting or efforts to reduce GHGs and dependence on foreign oil through consumer choice.

Working conservation

The potential ecological consequences of increasing corn production to feed these refineries are also worth attention. For example, increased production of corn for ethanol is putting pressure on regional agriculturally based conservation practices. These practices are particularly important in areas of intensive corn production, as corn is more erosive and its production emits higher levels of GHGs than any other row crop (Pimentel *et al.* 1995, Pimentel 2003, Meyer-Aurich *et al.* 2006). Corn's low nitrogen-use efficiency (37 percent; Doberman and Cassman 2002) has led to estimates that Mississippi River basin nitrogen pollution will, as noted, increase 10–34 percent with growing production for ethanol (Donner and Kucharik 2008). The EPA, in charge of implementing biofuel targets, expressed concern that expanding US biofuels production 'threatens to erase some of the gains of the last 20 years of Farm Bill and Clean Water Act implementation' (EPA 2006, 23).

The Conservation Reserve Program (CRP), for example, is under pressure. The CRP is a primary means of maintaining soil and water quality as well as protecting wildlife habitat on private agricultural lands. This voluntary program was developed, in part, as a supply control program paying farmers to 'set aside' more marginal land for conservation purposes. Nonetheless, the CRP has become one of the US's most effective private lands conservation tools, especially in areas of intensive agricultural production. For example, CRP land management reduces soil erosion, improves soil quality, protects regional waterways from nutrient leaching and helps to maintain scarce natural habitat amidst intensive agricultural production.¹² CRP grasslands also sequester large amounts of carbon and new studies have found that the land use change associated with growing corn for ethanol negates the carbon benefits of using ethanol over gasoline (Uri and Bloodworth 2000, Searchinger *et al.* 2008, Fargione *et al.* 2008, Piñeiro *et al.* 2009).

As land values and rents rose with cash receipts for grain, CRP acreage declined nationwide. In late 2007 total US CRP acres numbered 36.7 million and by March 2009 total US CRP acreage fell to 33.6 million, amounting to a loss of 4.1 million acres of conservation lands in little more than a year (USDA 2009). Numbers for Iowa are equally startling: nearly two million acres were enrolled in late 2007 and by early 2009 enrolment was reduced by 300,000 acres (USDA 2009). The majority of farmers interviewed were considering ending contracts to convert CRP land into

¹²More specifically, CRP land management increases soil nutrient and moisture retention (Davie and Lant 1994, Randall *et al.* 1997, Karlen *et al.* 1999, Baer *et al.* 2000, Huang *et al.* 2002). The CRP also provides suitable habitat in areas where little or none is present (Johnson and Schwartz 1993, Best *et al.* 1997, Coppedge *et al.* 2001); even isolated conservation lands help improve regional biodiversity by reducing landscape fragmentation in relatively simple landscapes (Dunn *et al.* 1993), which has relatively large effects for total landscape biodiversity and benefits agriculture by increasing pests' natural enemy populations (Tscharntke *et al.* 2005).

production. Some retiring farmers began renting out CRP land for production, so long as the newly renting grower would pay contract withdrawal fees (all earned contract income, plus interest). Farmers anticipated rising corn prices would cover this cost. In short, an Iowa farmer could earn far more renting conservation land for production or planting over five dollar per bushel corn on conservation land than the government's annual payments of just over \$100 per acre. One retiring farmer said, 'The big boys have their eyes on my land now – they'll give me two times as much as [the government programs will]. How can I resist that?' (Personal communication, August 2008, Clayton County, Iowa). As noted, interviewees also described absentee owners as demanding more for rent as Iowa cropland values increased an average of 19 percent between 2007 and 2008.

In addition to pressure on voluntary federal conservation programs, many producers changed longstanding agroecological production practices, such as crop rotation, which reduces the need for nitrogen fertilizer applications, maintains soil quality, and suppresses crop pest and disease pressures. In Iowa, farmers have historically rotated corn with at least soybeans and sometimes an additional crop in a third year. Corn production in Iowa in 2004 was pegged at 12.7 million acres and by 2007 this number hit 14.2 million acres (USDA 2010a). Land in soybeans decreased from 10.2 to 8.6 million acres over the same time period (USDA 2010a). Interviewees also frequently commented on large amounts of pasture, usually too steep or otherwise marginal for crop production, being converted to cultivation. A corn farmer put it simply, 'We're tearing the soils up so fast, in such a short time, to gain so little. It's just not worth it to me' (Personal communication, 27 June 2009, Bellevue, Iowa). These changes encapsulate the consequences of increasing biofuel production as a strategy of environmental governance that privileges the maintenance of agri-industry accumulation and gasoline consumption, if not GHG reduction, over situated benefits of conservation in intensive agricultural landscapes.

Despite pressure on conservation practice in the US Midwest, longstanding regional conservation networks organised to mitigate the effects of volatile corn markets that compel farmers to increase plantings to remain competitive. The US Congress laid the foundations for the Soil Conservation Service in the early 1930s in the wake of the dustbowl (Worster 1979, Manning 1995). To counteract commodity gluts and widespread land degradation, the federal government began to pay farmers for soil conservation and established the institutional infrastructure to ensure that conservation happened according to local needs. The SCS is now the Natural Resources Conservation Service (NRCS), which is responsible for administering conservation funding and providing conservation implementation advice to farmers and landowners. In addition to the NRCS, New Deal era programs facilitated organisation of Soil and Water Conservation Districts (SWCD). Democratically elected boards run usually county-wide SWCDs and are responsible for determining district conservation priorities and overseeing financial allocations. The NRCS must consult with the SWCD board and the board must hold public meetings where they make decisions about conservation practice, funding and priorities.¹³ I attended

¹³See McConnell (1953) for a discussion of how democratic, bottom-up, farmer led initiatives like the SCS and its allied agencies were targeted for marginalisation or elimination by agricultural groups that historically have supported intensive agricultural production, such as the Farm Bureau.

many SWCD meetings in northeastern Iowa counties between 2007 and 2009 and interviewed conservation technicians and NRCS employees in each county. I also listened and asked how SWCD commissioners felt about ethanol and rising commodity prices and how conservation efforts were changing in response.

In June 2008, record-breaking rainstorms brought massive flooding to Iowa agricultural lands. Conservation agents described large-scale erosion in areas where farmers removed conservation practices maintaining stream banks and grassed waterways. They described acres of soil washing down gullies created where grass waterways were too narrow or absent. Where waterside buffers had been removed or not adopted, the flooded creeks and rivers overwhelmed and washed out the grassless banks. Conservation agents also noted that areas that maintained conservation practices were far less affected. One NRCS conservation agent, when asked about connections between regional ethanol initiatives, corn prices and conservation practices answered, 'If that's what ethanol does, I'm not sure who it's helping' (Personal communication, September 2008, Manchester, Iowa). Conservationists, however, did not sit silently by watching county soil go down river. In response to another board member's complaints about the difficulty of convincing farmers to maintain ecological practices amidst rising commodities prices, a conservation district board member said, 'This is all of our problems. It's the market and we need to do what we can to work together'. (Personal communication, 14 August 2007, Waterloo, Iowa). Also reflecting this attitude, several NRCS office directors spoke of new efforts to appeal to farmers' conservation and land stewardship ethics to encourage program participation, as opposed to peddling the financial incentives offered by the federal government.

County conservation efforts face serious challenges to maintaining agroecological practices in the face of changing agricultural markets that give incentives to expanding intensive production. These challenges are not helped by federal and state conservation funding allocations. Nearly all county offices I spoke with described staffing shortfalls and job insecurity. In addition to state-mandated furloughs for some office employees due to 2009 budget cuts, those responsible for developing and implementing cornerstone watershed-level conservation practices suffered from high levels of job insecurity. Oftentimes, those who make initial assessments that qualify polluted watersheds as target areas for increased funding and who are most responsible for encouraging farmer participation do not receive guaranteed employment beyond the life of particular projects. Without entrepreneurial conservation staff to find grants, knock on doors, take water samples, and convince neighbours to participate, little conservation would happen. Moreover, state conservation funding has increasingly been derived from non-governmental organisations interested in conservation of private lands, such as Ducks Unlimited, the Nature Conservancy and Pheasants Forever. Consonant with research on neoliberal environmental governance, devolution, decentralisation and state retrenchment are occurring in agro-environmental conservation practice (see McCarthy and Prudham 2004, Prudham 2004, and Castree 2008 for a review). Nonetheless, these trends are balanced by the efforts of institutions like SWCDs that participate in bottom-up organising around conservation initiatives. Many farmers and conservationists I interviewed are making significant efforts to apply ecological knowledge to agriculture in place, working against an abstracting market rationality that allocates land use according to fluctuating prices rather than regional ecological conditions or residents' quality of life concerns.

Creating the Corn Belt

My research suggests US agrofuel production may generate advantages in the city and costs in the countryside, as has occurred in the past when urban interests define what constitutes 'nature' and its appropriate use (cf. DuPuis 1996). Lifecycle analyses and a politics based on fuel consumers' choices do not articulate an alternative or oppositional politics for rural regions producing agrofuel. By politicising agrofuels as a question of carbon accounting or maximising consumer choice, negotiating toward other outcomes is made more difficult. These politics do not address, for example, working toward improved environmental quality in the US Midwest or a redistribution of profits and risk in agro-industrial sectors.

Though biofuel policies may not have been formulated with intentional disregard for rural landscapes and livelihoods, as Scott (1998) points out, government policies often more effectively address that which is 'legible'. Certain aspects of US biofuels policy are easily counted, supported, and governed, like reducing corn surplus, fossil fuel consumption, GHG emissions, or dependence on foreign oil. Other policy issues are less easily confronted, such as addressing longstanding and unequal political economic relationships in agriculture or supporting conservation initiatives at odds with increasing corn production. Instead of addressing less tractable issues, policymakers and politicians make implicit assumptions that benefits will accrue to all and portraying US ethanol producing regions as happily accepting a new golden opportunity. For example, Iowa's Republican Senator Charles E. Grassley, during campaigns for the 2008 US Presidential election, said, 'Nowadays, I think [Iowa voters] kind of expect people to be for ethanol – whether they're newly born-again ethanol people, or old-fashioned, long-term ethanol people' (Murray 2007). Despite the uneven effects of pursuing corn ethanol production, Grassley paints a homogenous picture of Iowans' ethanol opinions – they are all for it and expect their candidates to be pro-ethanol too. An ethanol industry publication, put it this way: 'In recent years, Iowa has become primarily known in other parts of the US for two things: corn and ethanol' (Bevill 2010). From these perspectives, one can imagine the US Midwest as the 'Corn Belt' and a simple 'commodity-supply zone' – an 'asocial void, a depopulated space without socioecological complexity' (Bridge 2001, 2154). In this view, the Midwest is narrowly and statically defined by the production of raw materials for an industrial society, which elides the social, political and economic decisions made in the region's creation, as well as its other potential social or ecological futures.

Conclusions

Rapid increases in agrofuel production mean changing configurations in environmental governance, political economic dynamics, and socioecological outcomes. I argued that agrofuels production can be understood as an 'environmental fix' – a socioecological project indicative of the contradictory capitalist imperatives to exploit, protect and create new resources for accumulation. By substituting agriculturally based fuel for fossil fuels, agrofuel production's proponents aim to reduce GHG emissions and dependence on foreign oil, while maintaining agro-industrial capital accumulation. The outcomes of this 'environmental fix' are influenced by the Midwest's history of agro-industrialisation and agrarian political economy describes the foundations on which this accumulation through agrofuels

production is based. Agro-industrial firms have long marginalised agricultural producers through market domination and the consequences of agrofuels production resemble this history. I have shown how rural residents negotiate an agrofuels future that bears significant ecological and economic risks in the form of concessions to corn cultivation and refineries that return few reliable benefits to rural residents.

Future public and private investments in biofuel production and use are likely to be significant and the ability of rural areas to capture or maintain any social or ecological benefits will depend upon mechanisms of environmental governance, the social and political economic context within which farmer decisions are made, and how those engaged with agrofuels production politicise its causes and effects. This research demonstrates the importance for future research and policy efforts to engage with these areas to maintain equitable agrofuels development. I argue that politicising agrofuels in terms of their carbon content alone, as has occurred in recent US public debates, limits negotiation over these changing socioecological conditions of agrofuels production. Increased focus on the political economic foundations of unfolding agrofuels projects, achieving a more even distribution of risk and reward, and on improving ecological outcomes beyond carbon budgets might better represent some of the interests of agrofuel producers. The outcomes described here are symptomatic of environmental governance under capitalist socioecological relations, but the market episteme that dominates agrofuel policy and production is not total. Conservationists, farmers and residents are working to steward regional resources and these networks may be grounds for alliance to challenge an agrofuels future that would reinforce current, unequal configurations of social and ecological relations in the Corn Belt.

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