

Title: *Farmers' Perceptions of Climate Change in Context:
Toward a Political Economy of Relevance*

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Toward a Political Economy of Relevance

Abstract: Sociologists commonly hypothesise that experiencing the impacts of climate change will lead actors, including farmers, to desire to address climate change. It is increasingly clear that farmers can detect the regional biophysical expressions and impacts of climate change. However, this has not led farmers to desire to take action on climate change. This begs the question: how then are farmers interpreting these experiences? We argue that political-economic context, the structural conditions of capitalist production, contributes to how farmers perceive and understand the impacts of climate change. We draw from our novel political economy of relevance theoretical framework and apply this framework to a sample of over 100 qualitative interviews with Iowa and Indiana row-crop farmers. We focus on their experiences with heavy rain events, a key impact of climate change in the Midwest. Our findings suggest that farmers become aware of, interpret and respond to heavy rain events within the context of capitalist production. This leads most farmers to see heavy rain events as barriers to achieving capitalist goals, rather than as signals of the reconsider climate skepticism or the need to mitigate contributions to climate change.

Introduction

Agriculture is dually implicated in climate change (Weis 2010). Globally, it is a significant contributor of greenhouse gas emissions and is highly vulnerable to the impacts of climate change (IPCC 2018). While agriculture's vulnerability to climate change can be reduced through adaptation (Howden et al. 2007), mitigation in agriculture requires the widespread use of agricultural practices and management strategies that reduce greenhouse gas emissions – a transformation that faces many challenges (Stuart et al. 2014; Stuart and Houser 2018; Roesch-McNally et al. 2018a).

Though they clearly recognise that multiple factors may motivate or constrain farmers' ability to act on their climate change views, a number of scholars have proposed or explored the potential that farmers' *desire* to address climate change may be motivated by their experiences with biophysical expressions and impacts of climate change on agricultural production (Arbuckle et al. 2015; Morton et al. 2017; Houser et al. 2017). Extreme conditions may be particularly motivating: Arbuckle et al. (2015: 227) argue that extreme weather variability impacting agriculture may be leading to an "openness to action on climate change among major agricultural actors." These hypotheses, in many ways, accord with the broader predictions of a number of environmental sociological theorists: societal responses to environmental issues emerge as the consequences related to pollution and resource degradation are experienced (Beck 1992; Schnaiberg 1980).

However, recent studies indicate that experiencing the effects of climate change may not be a factor leading farmers to increase their support for climate change mitigation (Houser 2018; Roesch-McNally et al. 2018b). The impacts of climate change, particularly extreme weather events, have become increasingly apparent and these events are harming agricultural systems

across the globe (IPCC 2018). Evidence from the United States (US) shows that farmers are highly attuned to these shifts and many can accurately identify climatic trends in their region (Houser et al. 2017; Doll et al. 2017). But, notwithstanding the history of climatic events, farmers overwhelmingly express views that are antithetical to mitigating agricultural contributions to climate change: the majority of farmers in the United States still do not believe humans are a key cause of climate change, are uncertain of climate change, and remain unconcerned about the impacts of climate change on their farm (Arbuckle et al. 2013a, 2013b; Houser 2018; Roesch-McNally et al. 2018b; Rejesus et al. 2013). US farmers' skeptical views are mirrored in farmers' attitudes in "developed" countries around the world (Prokopy et al. 2015). As two of the authors have previously suggested (Houser et al. 2017), 'seeing is not believing' for farmers and even after acknowledging their experience with climatic extremes many continue to be resistant to the idea of the need to mitigate agricultural contributions to climate change.

If farmers can perceive and are experiencing the impacts of climate change and this experience is not leading them to support climate change mitigation efforts, this begs the question: How then are they interpreting their experiences with the impacts of climate change? The answer may be related to how political-economic context shapes farmers' perceptions and interpretations of their experiences with climatic events. As we learned from the earlier constructivist-realist debates in rural and environmental sociology (e.g., Dunlap and Catton 1994; Burningham and Cooper 1999), humans do not simply experience the biophysical world. Rather, social processes and contexts influence how actors perceive biophysical phenomena, or if they see it at all (Carolan 2005a; Freudenburg, Frickel, and Gramling 1995; Greider and Garkovich 1994). In this case, the political-economic context likely shapes how farmers come to interpret their experiences with the biophysical effects of climate change, but overall attention to

this remains limited. We expand on this literature exploring actors' perceptions of their material environments and specifically farmers views of actual climate change impacts by responding to calls to further develop our understanding of how biophysical factors shape humans' environmental perceptions – and how this is specifically mediated by political-economic context (Carolan and Stuart 2016; Stuart 2016).

To accomplish this goal, we apply a novel theoretical framework that merges Alfred Schutz's theory of relevance with Theodor W. Adorno's sociology. This approach enables us to consider how the structural context of the agricultural political-economy shapes farmers' views at the individual-level and in this way, allows us to respond to call for empirical cross-scale (macro→micro) analyses, specifically in the agricultural context (Stuart et al. 2015).

We do not assume the political-economy is the sole contextual factor limiting farmers from considering the seriousness of climate change for agriculture or their contributions to it. But we focus on this context in our study, as it is both a prominent context in agricultural production (Magdoff et al. 2000) and because its role in shaping farmer cognition on climate change has been given little attention (see below; c.f. Stuart 2018). Our results suggest how political-economic context is shaping farmers experiences with the impacts of climate, focusing on heavy rains. We draw from a sample of over 100 personal interviews with US row-crop farmers to examine these interpretations. Below, we introduce our rationale for and the details of our theoretical framework. We then provide necessary background information on agriculture and climate change, describe our research methods, and discuss our findings and conclusions.

Toward a Political Economy of Relevance

Understanding responses to climate change has been explored through both micro (individual) and macro (structural) theoretical lenses. While much attention has focused on macro

phenomena related to climate change, such as well-funded denialist campaigns, international agreements, and carbon markets (Beck 2010; Klein 2014; Stuart et al. 2017), others have focused on psychological factors regarding how individuals perceive and process information about climate change (Hart et al. 2015; Jost et al. 2008; Feygina et al. 2010; McCright et al. 2014; Unsworth et al. 2014; Wilke and Morton 2017). However, largely missing from the climate change literature is an analysis of how political-economic structural context shapes individuals' perceptions, beliefs, and actions (Carolan and Stuart 2016; Stuart 2016).

In general, rural and environmental sociology would benefit from a greater range of theoretical approaches that allow for the integration of the individual and political-economic structural realms (Stuart 2016). Ecological Marxism applied to environmental and agricultural issues has revealed unequal power dynamics and how profit-orientation remains a driver of negative ecological and social impacts (e.g., Schnaiberg 1980; Foster 1999; Gould et al. 2004). Scholars have illustrated how this context constrains the choices of agricultural producers (Hendrickson and James 2005; Stuart 2009) and how profit-driven agribusiness firms negatively impact producers, agricultural communities, and the environment (Magdoff et al. 2000; Hauter 2012). Actor-network theory (ANT) highlights the individual human and non-human actors involved in social-ecological systems, yet in most applications the focus on individuals obscures the power dynamics and motivations driving specific relationships (Murdoch 2001, Stuart 2011). Carolan (2005a,b; Carolan and Stuart 2016) offers a more deliberate approach to bridge the individual and social-structural realms. Drawing from Soper (1995) and Bhaskar (1975), Carolan (2005a,b) illustrates how, through a stratified critical realist approach, individual constructions of nature, biophysical nature, and nature-society hybrids can all be incorporated into a single theoretical framework. In a revision of this framework, Carolan and Stuart (2016) highlight the

role of “real” political-economic structural forces such as the treadmill of production and neoliberal ideologies that shape social-biophysical relationships. Despite its potential, this approach has not been widely applied to understand how the political-economic context shapes actors’ views or cognition related to climate change at the individual level (for one example, see Houser et al. 2017).

To increase the range of theoretical approaches that allow for an integrated analysis of individual perceptions and political-economic structural context, we introduce a political economic theory of relevance. This approach highlights how political-economic structural context shapes cognitive attention and interpretation, as well as what actions are considered rational and what futures seem possible. It is particularly appropriate to examine individual interpretations of and responses to climate change. Integrating social phenomenology and Western Marxism, this approach gives specific attention to how the capitalist social order acts as a dominant motive and rationality that shapes interpretations of climate change and limits individuals to solutions that conform to capitalist logic. Below, we explain this theoretical approach and then apply it to examine climate change interpretations and responses among US Midwestern corn growers.

A Political Economy of Relevance

A political-economic theory of relevance integrates Schutz’s theory of relevance with Adorno’s sociology and critique of phenomenology (see Gunderson et al. In press). The goal of the theory is to analyse what Schutz (1967c: 250) called the “problem of relevance” – “the question of why these facts and precisely these are selected by thought from the totality of lived experience and regarded as relevant” – from a perspective that is more attentive to social-structural conditioning of human consciousness and action. Here we summarise Schutz’s (1) topical-(2) interpretative-

(3) motivational relevances heuristic and extend his explanation for relevance systems via Adorno's sociology. We examine farmers' views of climate impacts through these three forms of relevance further below.

Schutz (1970: Ch. 1) develops a three-part typology of *kinds* or *forms* of relevance: (1) *topical* (or thematic) relevance, (2) *interpretative* (or interpretational) relevance, and (3) *motivational* relevance (see also Schutz and Luckmann 1973: Ch. 3, Part B).

“[I]n the midst of the unstructuralized field of unproblematic familiarity,” various phenomena become topical or thematic in experience, which Schutz (1970: 26) calls “topical relevances.” Like other forms of relevance, topical relevances are either imposed on consciousness (an “imposed” relevance) or voluntarily turned to (an “intrinsic” relevance) (Schutz 1970: 28ff; Schutz and Luckmann 1973: 190, see 186ff; Dreher 2011: 498-499). For example, stopping a passer-by on the street to ask for directions has an intrinsic relevance for the direction-asker whereas the response or silence of the passer-by has a topical relevance for her (Wagner 1983: 69). Although Schutz (1970: 56ff) was more interested in the structure of the subjective experience of relevance than how and why the shape, extension, texture, size and other material features of biophysical objects influence relevance structures, he does provide examples of how biophysical objects impose themselves on consciousness and becoming thematic (see below for an example). Just as themes can be “socially imposed,” where the another's actions “place themes before the individual”, it seems clear that themes can be “naturally imposed,” where an aspect of the biophysical world “jumps out of the horizon of the flow of experience ... into the core of the flow of experience” (Schutz and Luckmann 1973: 190, 189).

Interpretative relevance refers to the subsumption of a topic or theme under a “typification.” Schutz (1966) argues that we experience objects as “general,” “pre-familiar” types because our own experiences and the experiences of others afford us a collection of typifications (our “stock of knowledge at hand”) that we use to make sense out of everyday life (Schutz 1967a: 7ff): “the outer world is not experienced as an arrangement of individual unique objects, dispersed in space and time, but as ‘mountains,’ ‘trees,’ ‘animals,’ ‘fellow-men’” (Schutz 1967a: 7-8). We select typifications, usually unreflectively, based on a number of factors: our own previous experiences with similar objects, learning from intimate or distant others about their experiences of similar objects, our practical goals in interacting with the object (our “purpose at hand”), and the social context (Schutz 1964: 234; see also Cox 1978: 9ff). Future action is in part based on selected typifications because our stock of typifications form “the frame for any possible action he might choose to undertake, but, more significantly, the frame for any possible rational action” (Cox 1978: 8).

Motivational relevance primarily refers to our action-orientation toward the given theme, which has a “dual aspect” (Wagner 1983: 71): “in-order-to motives” and “because-motives.” In-order-to motives are the “reasons that persons give themselves to explain their conduct” (Wagner 1983: 60) whereas because-motives are the background conditions and experiences that cause action, causes that the actor often has no knowledge of (Schutz 1967c: 130f). Motivational relevance also has to do with explaining why objects become topically relevant, why they are interpreted as they are. Rather than examining how motivational relevances influence action, which is Schutz’s central concern with motivation, we are primarily interested in how because-motives and in-order-to motives influence what perceived content becomes thematic and which typifications are utilised to interpret a theme (Schutz and Luckmann 1973: 209-210).

Because “thematic [topical] as well as interpretative relevances are indissolubly bound up with the motivational bind,” there are overlaps in our analysis of relevance structures below (Schutz and Luckmann 1973: 209). Schutz and Luckmann (1973: 209, 210) differentiate motivational relevance as a distinct relevance structure to explicate why becoming “subjectively certain” about a theme with competing interpretations is “*motivationally* important” to actors. In other words, motivational relevance concerns how our motivations condition action *and* consciousness. However, we believe the influence of motivational relevance on topical and interpretative relevances is undertheorised. Schutz (1970: 64) defines “interest” as “the system of motivational relevances which induced me to make a certain aspect of the object in question the topic of my investigation or concern” yet his discussion of the “whys” of topical relevance—why consciousness thematises particular objects—does not adequately explain the influence of motivational relevances on attention and the selectivity of consciousness (see especially Schutz and Luckmann 1973: 186ff). His discussion of topical relevance attempts to explain attention without a serious consideration of motivational relevance and, similarly, his theory of motivational relevance strives to explain action without deeply investigating the impact of interest on topical relevance. We address these oversights.

Topical, interpretative, and motivational relevances are an “undivided unity” (Cox 1978: 90) and interdependent because changes in one kind will alter others (Schutz 1970: Ch. 3; Schutz 1970: 68ff; Schutz and Luckmann 1973: 223ff). In other words, the theory of relevance types is also a theory of “relevance systems.” Schutz’s principal illustration is helpful. When a coiled, cord-like object on one’s floor becomes topically relevant, one can adopt two different typifications - rope or snake - to make sense of the situation (*interpretative relevances*). If interpretation remains ambiguous, one may decide to poke the object with a stick not only *in*

order to gain more information about the object, but also *because* one is afraid of snakes (*motivational relevances*). Two of our contributions to the theory of relevance are: (1) more thoroughly examining the influence of motivational relevance on topical and interpretative relevances (i.e., how interest influences thematisation and interpretation) and (2) explaining the political-economic influences on relevance systems.

We think Schutz's theory of relevance offers a valuable heuristic for sociologists interested in the human dimensions of environmental problems. For instance, without explicitly drawing on Schutz's theory of relevance types, Ollinaho (2016) recently developed a Schutzian explanation for climate change inaction, arguing that climate change is experienced as an intellectual problem among citizens of the Global North, a problem that is irrelevant when compared to everyday pragmatic concerns (for assessment, see Gunderson et al. In press). Ollinaho (2016) work clearly points to the potential a Schutzian perspective for understanding climate change inaction/views and begins to correct Schutz's limited perspective, which remains focused on internal, subjective experience (Habermas 1988: 112; cf. Mayrl 1973; McNall and Johnson 1975; Habermas 1987: 129f). Schutz acknowledges this limitation in his posthumous *Reflections on the Problem of Relevance* (1970: 73) where he admits that he tackles the problem of relevance "as if there were no social world at all." We correct this limitation by embedding relevance systems in social-structural contexts by revisiting Adorno's sociology and critique of phenomenology.

Although Adorno was critical of phenomenology throughout his career (e.g., Adorno 1982; see Dallmayr 1976; Valone 1988; Wolff 2006; Gordon 2016), he aspires to continue phenomenology's attention to the "reciprocal constitution of consciousness and objectivity" (Clucas 2000:15) without its ideological blinders and systematisation (Adorno 1973:26f), as well

as placing consciousness in social-structural context. We argue Adorno's program can contribute to Schutz's tripartite theory of relevance types. First, Adorno provides a political-economic explanation for 'because motives'. Following Adorno (1967), we focus attention on how political-economic context influences the establishment of "paramount projects" and motivate one's actions and interest in the world. If you trace out the "chain" of motivational relevances to social conditions, you will find that almost all because-motives have some relation to capitalist imperatives, even if indirect. As noted above, we are primarily interested in how 'because-motives' and 'in-order-to motives' influence topical and interpretative relevances, rather than how motives influence action. Second, Adorno's analysis of "identity thinking" overlaps with Schutz's analysis of typification. Schutz's argument is that typifications suppress particularising characteristics of objects in order to realise practical projects. Adorno makes the same argument in his reflections on "identity thinking", though discusses cognition in political-economic context: capitalism requires that an object's particularising traits be ignored, leveling unlike objects for exchange. Third, Schutz's notion of topical relevance can similarly be understood in political-economic context by examining the social-structural reasons *why* particular aspects of reality become thematic while others remain unproblematic.

Adorno's Marxist framework and Schutz's social phenomenology are mutually beneficial. Schutz delivers a refined conceptual toolbox for *describing* the dynamics and characteristics of *ideology* and Adorno provides an *explanation* for "*why* these facts and precisely these are selected by thought from the totality of lived experience and regarded as relevant" (Schutz 1967c: 250, emphasis added), why we interpret themes under particular typifications, and why we act toward relevant material in particular ways. The political-economic theory of relevance is particularly helpful for examining the role of social-structural context in

shaping (motivating) midwestern farmers' awareness (topical relevance) and understanding (interpretation relevance) of climate change, focusing on their experience with heavy rain events, a key impact of climate change on agriculture in the midwestern United States (US). We now provide the necessary background on Midwestern farmers' experiences with the impacts of climate change.

Midwestern farmers' experience with heavy rains

The Midwestern agriculture system, like other regional systems in the United States, has already experienced the effects of climate change. In the Midwest, warming average temperatures and rising humidity are increasing the occurrence of extreme weather (Pryor et al. 2014). Of these events, heavy rain events may present the most serious and overt threats to farmers. Heavy rainfall events are defined as the heaviest 1% of all events (Karl et al. 2009). As a result of shifts in average temperature and precipitation conditions, the frequency and intensity of heavy precipitation events has increased across the Midwest (Pryor et al. 2014). Relative to the heaviest 1% of all rainfall events from the 1951- 1980, there has been a 23.6% increase in the frequency of heavy rains across the region (GLISA, No Date). The occurrence of heavy rains is contributing to increasing nutrient and soil losses from agricultural soils, impairing water quality, and reducing farmers' profits (Robertson et al. 2013). They have also been associated with declining average crop yields across the region (Liang et al. 2017; Melillo et al. 2014). The challenges that climate change impacts, including heavy rains, poses to Midwest agriculture are expected to increase (Pryor et al. 2014).

In particular, nitrogen fertilizer is being impacted by heavy rain events. Given farmers' attention to this impact in our study (see results), it is important to understand this relationship. Nitrogen (N) remains a key agricultural input for the Midwestern row-crop system. It is vital for

corn production, the dominant crop in the region given the simplified rotational system practiced by the majority farmers (Wolf and Buttel 1996). It also represents a significant source of water and air pollution (Ribaud et al. 2011). For instance, it is responsible for over 75% of the dead-zone in the Gulf of Mexico (Ribaud and Johansson 2006). N is a mobile nutrient and in consequence highly vulnerable to heavy rain events (Robertson et al. 2013). These events increase loss of N to the environment, harming aquatic ecosystems and causing N deficiencies for corn, thereby threatening farmers' corn yields (Davidson et al., 2012; Robertson et al., 2013).

It is increasingly clear that farmers are highly attuned to the growing occurrence of extreme weather events generally and heavy rain events particularly (Houser et al. 2017; Morton et al. 2015; Roesch-McNally et al. 2018b). For instance, while Michigan farmers in focus groups held by Doll and colleagues (2017) were perceiving a number of climatic shifts, heavy rain events were the most discussed event and the one farmer felt was most threatening to production. Guided by a political economic theory or relevance (as described above), we examine how the political-economic structural context of industrial agriculture shapes farmers' awareness and interpretations of these events and suggest why these interpretations dissuade participation in climate change mitigation efforts.

Methods

To explore how political-economic structural context influences farmers' perception of heavy rain events, we used qualitative data gathered from 104 interviews with row-crop farmers in two Midwestern US states: 53 interviews in Iowa (IA) and 51 in Indiana (IN). Interviews were conducted on a one-on-one basis between a researcher and the farmer between May 2014 and September 2014. All interviews were done in person on-farm and were audio recorded with the permission of participants. Interviews lasted between 22 minutes and 2.5 hours. Interview

questions focused-on farmers' management of nitrogen fertiliser and how various factors (e.g. information source use, state-policy), including climate change impacts, were viewed and shaped their management decisions.

Each interviewed farmer grew at least 100 acres (40.5 ha) of corn per year and total farm sizes ranged from 170 to 14,000 acres. Generally reflecting the broader corn-soy farming population in the region (NASS 2012), all farmers were white men and spoke English. By design, they were also the primary decision-makers on their farm. In both states, initial contacts were generated through University Extension, county Soil and Water Conservation District offices and various farmer associations. A snowball sampling technique (Coleman 1958), where initial respondents recruit secondary participants from among acquaintances, was used to generate further contacts.

As University Extension was the primary source of contact for interviewees (40%), farmers in this sample may be more aware than the average farmer of the environmental consequences of N loss, human dimensions of climate change and its connection to heavy rain events. Given their likely greater awareness of the environmental context of climatic events, this is an ideal sample to explore the role of political-economic context in shaping farmers' perceptions of the impacts of climate change toward capital considerations.

Upon completion, interviews were transcribed verbatim. To identify farmers' experiences with and perceptions of climate change and heavy rain events, we first coded farmers' responses to a set of standard-questions on their views of the occurrence of climate change, its local expressions, causes, impacts and what farmers can do about climate change. Finally, information on the political-economic context was not specifically sought via the interview guide. Farmers generally spontaneously discussed this when justifying their management practice decisions and

contextualising experience with climatic events, particularly related to potential yield loss. We incorporate this information to inform our understanding of their experience with the political-economic “motivational” context.

Following Crabtree and Miller (1999), we used a deductive coding approach to explore our theoretically informed research question: How does the political-economic context shape farmers’ views of their experience with climate change and heavy rain events. Our results therefore do not encompass every interpretation of heavy rains event offered by farmers, nor every motivating factor. However, a deductive approach is well suited to explore causal relationships (Gulati 2009), and thus an appropriate analytical method for our purposes.

Results and Discussion

We present our results below in three sections that reflect Schutz’s conception of relevance types: topical relevance (farmers’ awareness of heavy rain events), interpretative relevance (how farmers understood the meaning of these events), and motivational relevance (the background contexts that shaped farmers’ topical and interpretive relevances). We begin by discussing motivational relevance to suggest how capitalist production characterises the social context that influences farmers’ awareness and understanding of heavy rain events.

Motivational Relevance

Motivational relevance is the realm of Schutz’s model that explains not only the “whys” of action, but also attention and interpretation. We are concerned with the latter processes: why do certain experiences (and not others) become thematic in experience (become topically relevant) and why do we come to understand these experiences in a particular way (interpretative relevance). Schutz argued that an individual’s *because motives*, their background conditions and

experiences, explain many of these whys. Adorno's (1970) work suggests that in contemporary society the structural context of capitalism directly and indirectly conditions because motives.

The agricultural system in which interviewed farmers act is a specific sector of contemporary capitalist production and therefore reflects the capitalist imperatives and logics (Magdoff et al. 2000; Friedland et al. 1981). Specifically, Levins and Cochrane (1996) argue that farmers must continually pursue profits (through technology adoption) or face the risk of succumbing to a neighboring farmers' expansionary actions. Interviewed farmers often commented on experiencing the specific political economic pressures discussed by Levins and Cochrane, including debt, tightening profit margins (as crop prices decline due to industry wide production increases) and competition for land. For instance, an Indiana farmer illustrates the presence of these competitive pressures when responding to question asking if neighboring farmers influenced his practices:

“[pause] I ain't got many neighboring farmers. There is one big farmer, farms all the way around me [...] Yeah, they're big. They're farming 4,000 or 5,000 acres, so many of the littler farmers that used to be around have been absorbed up by them, and in fact if I'd say something to them about farming [my land], it probably 'shwump' [sound effect indicating this large farmer would overtake his farm too]” (IN41).

Farmers were concerned about numerous factors in farm management decision making: environmental outcomes, neighbors' opinions and their capacity to pass their land down to future generations. But, because of structural political-economic pressures, their primary objective was to increase production and achieve profits (though this was often seen to be in-line with these other concerns). As one Indiana farmer discussed, “Profit driven, you know, productivity driven, that's the way I think you need to be if you want to be in business” (IN11). Other farmers, like

this Iowa farmer, noted how they were continually participating in competitive struggles to achieve production and profits: “If a piece of land comes up for rent, that’s who I am competing with, we are all trying to get that same land lord or land owner to rent that land to me” (IA20). Given that profits were their primary concern, other dimensions of agricultural production, like its environmental consequences, were not prioritised. While this was articulated by a number of farmers, one Indiana farmer expressed it most directly: “In the end the economics seem to win out [...] it’s down to whatever works best economically. The environmental side then, probably kinda takes it in the shorts because that becomes secondary” (IN04).

Interviewed farmers’ primary concern was profitability. As Adorno (1970) argues, we cannot separate this paramount project from the structural context of capitalism. Some farmers specifically discussed how this structural context was the source of their profit-orientation. For instance, an Iowa farmer justified his focus on production/profits stating, “We do need to live with the economic system” (IA04). An Indiana farmer also indicated that the structural context drives this profit-imperative, explaining “We’re trying to make money first, hate to say it, but... we’re in a capitalist society, that’s part of it” (IN23). Other farmers discussed feeling trapped by this system. For instance, one Indiana farmer felt the personal desire and social pressure to reduce agriculture’s environmental impact by limiting input use. However, he felt that he could not address these impacts because, as he argued:

“What kind of safeguard do you have for me from an economic reality? [...] Go off my balance sheet and where I have debt, and it shows I need to service that debt, do you guarantee me that I’m going to get enough corn production to substantiate that?” (IN44).

The agricultural system in which interviewed farmers operated was highly profit-oriented and reflective of the broader capitalist system. Farmers tended to emphasise that profits and

production were their primary motivating goal in agricultural production and decision-making broadly. This orientation emerged from the capitalist context and creating situations where farmers felt it was necessary to act on given political-economic pressures. In Schutz's language, profit-making is farmers' "paramount project," and reflecting Adorno's arguments, this project was *imposed* on them by a central *because motive*, the background context of the capitalist system, which presents numerous pressures that compel farmers to prioritise profitability. As we noted above, motivational relevance is the realm of Schutz's model that explains the why of perceptions. We now turn to discussing how the because-motive of capitalist production and the project of profit-making shaped both farmers' awareness of heavy rainfall events and their interpretation of the effects of these events.

Topical Relevance and Motivation

Topical relevance refers to phenomena becoming the "topic at hand" or the theme of our experience (Schutz 1970). According to Schutz, most phenomena are unproblematic and taken-for-granted in experience and, within the modality of perception, only particular phenomena become "problematic" or "thematic" because they are either "imposed" on consciousness or voluntarily turned to (an "intrinsic" relevance). Like everyone else, farmers in our sample have infinite stimuli vying for their attention. In this crowded field of experience, climatic events generally and heavy rain events in particular were topically relevant to interviewed farmers. Indeed, they were highly aware of their occurrence. (i.e., heavy rain events were thematic events). As shown below, farmers' selectivity of consciousness (topical relevance) is influenced by the 'because motive' to maximise profits, reflecting Schutz's argument that relevance systems (topical, interpretative and motivation) are interrelated and Adorno's argument that capitalist imperatives influence cognition.

In response to questions about their climate change perceptions and experiences, interviewed farmers often described their experience with weather patterns/climate change impacts in the region. Many (41%) could accurately identify climatic trends overtime. Farmers discussed the increasing occurrence of droughts, longer-growing seasons, decreasing amounts of snowfall and most relevantly, the increased occurrence of heavy rainfall and “extreme” weather events (which was almost always used to refer to heavy, or very heavy, rainfall). As in past studies of Midwestern farmers (Doll et al. 2017; Morton et al. 2015), most of the interviewees who felt like they had experienced trends in changing conditions noticed the increasing occurrence of heavy or “extreme” rains. As one IA farmer illustrated with his comment: “The rain events are larger, seems like we get more of them in the spring” (IA12). Related to the impacts of climate change, 58 (56%) reported that their farms had been negatively impacted by heavy rain events in recent years (33 in Iowa, 25 in Indiana) out of the 104 interviewees. Heavy rain events were one of the most topically relevant climatic events to farmers.

Farmers commented that they paid close attention to climate events because they have significant bearing on their capacity to produce a profitable crop. This was frequently discussed by farmers in both states. As one Indiana farmer explained: “Mother Nature dictates to us what kind of crop we are going to have” (IN42). Another similarly said, “Experts talk about this too, 80% of our yield is determined by the weather” (IN12). Others spoke similarly about the significant of weather/climate events for profitability: [The] things that Mother Nature throws at us are the variables that we have to fight” (IA40); “But for the most part, this crop is out of our control; it’s in mother’s nature control, so we are vulnerable to that” (IN14). Another stressed how if he knew what the weather was going to be, he could prepare effectively enough be “down at the beach in Cancun” during the growing season (IA16). Because he could not predict

weather, he, like other farmers in the sample, was highly motivated to pay close attention to weather patterns and climate impacts.

Following from this general attention to the economic impacts of weather/climate impacts, farmers appeared to be particularly aware of the increasing occurrence of heavy rain events because of these events' acute impact on profits. In one manner, this impact happens through heavy rain events causing the loss of N fertiliser, which threatened yield production and thus profits. As one farmer discussed:

“With the amount of rain that we had following our sidedress application [of nitrogen], experience told us we were going to run out [of nitrogen]. At the most critical time that that corn plant needed nitrogen, we were going to start running out. We knew that it would have a drastic effect on yield” (IN35).

Other farmers focused on the costs of N loss as an indicator of increasing intensity of heavy rains. One discussed how heavy rain events lead to N loss from fields, which was basically like watching his money be washed away: “The extremely weather conditions, the cost of that is pretty huge [in terms of N loss]” (IA21). An Indiana farmer emphasised how the increasing loss of N was the indicator of increase heavy rains overtime: “It seems like we have more extreme weather [i.e. heavy rains]...[20 years ago] it didn't seem like we got [N] washed out [of the soil] as much as we do [now]” (IN18). In response to a question about if he felt like there had been changes in the weather pattern overtime and what impacts those had on him, an Iowa farmer similarly pointed out how the increasing intensity of heavy rain events was made 'relevant' to him via economic impacts on N: “Yeah I think we've gone to more extremes [overtime...] when you get these heavy rains its harmful [...] We lose our nitrogen that we all spend money to put out there, it's not cheap” (IA51).

As these comments indicate, the increasing occurrence of heavy rain events were topically relevant to farmers in our sample not only because they were a physical phenomenon they experienced, but also because of the political-economic context (motivational relevance) in which farmers experienced them. They were topically relevant because of the potential impacts on N loss, crop yields, and profit. Farmers not only generally paid attention to weather and climate trends because of their economic impacts, but farmers' above comments suggest this was the initial point through which heavy rain events were noticed—N loss had become more severe or frequent, indicating more heavy rain events. These findings affirm our theoretical premise: we cannot separate the topical relevance of climate events, like heavy rain events, from the political-economic context in which farmers experience these biophysical phenomena. Motivational relevance is the dimension of experience that explains why phenomena become topically relevant (Schutz 1970) and for farmers it appears that this is substantially shaped by because-motives necessitated by the structural context of capitalist production, reflecting Adorno's (1973) argument.

Interpretative Relevance

Schutz (1964) argues that a topically relevant phenomenon is also interpreted with our "stock of knowledge at hand." Like Goffman's (1959) notion of "frame," interpretation is the process of selecting certain attributes as relevant, while disregarding or de-emphasising other attributes. Unlike Goffman, Schutz sees this sorting occur in relation to a broader set of object classifications, or "typifications" (see above). Actors typically "intuitively" and automatically assign typifications to phenomena. In fact, we are *preacquainted* with objects through types (Schutz 1967b: 279) and rarely consciously think about type selection, though some situations require conscious type selection (see Schutz's example from Carneades above). We experience

reality *through* types based on past experiences with the object, familiarity, and our purpose at hand. Schutz refers to this process and dimension of experience as “interpretative relevance.”

Farmers can typify, or classify, their experience with heavy events in a number of ways. As we noted earlier, scholars have rather frequently argued that the impacts of climate changes, like the increasing occurrence of heavy rains, will be understood in ways that promote pro-environmental altitudinal shifts among farmers (Arbuckle et al. 2015) but recent results find it does not (Houser et al. 2017; Stuart 2018). If farmers are not typifying these experiences as indications of the need to re-consider their climate skepticism and/or undertake mitigation, how then are they experiencing the impacts of climate change?

As illustrated above in our discussion of motivational relevance, interviewed farmers face political-economic pressures to pursue profits and maximise production. These pressures, as a motivational backdrop, direct farmers’ attention to their experiences with climatic events like heavy rain events. It is important to recognise that there is no inherent meaning associated with these biophysical events and, in consequence, how farmers come to primarily interpret them is shaped, at least in part, by their existing political-economic context. Because of the presence of processes that materially demand the pursuit of production and profits, farmers are highly attuned to the consequences of heavy rain events for their capacity to meet these ends. As a result of this motivational context, climatic events, like heavy rains, are not interpreted as an indicator of the faults of the system—that it relies on inputs and practices that emit significant amounts of greenhouse gases—but instead as a barrier to achieving the system’s goals—production for profit.

Reflecting this point, farmers that had experienced N loss from heavy rain events primarily typified this impact as a barrier to production, this typification being expressed through

their primary or exclusive focus of the consequences of N loss for their crop production and profitability. Noted earlier, N is a vital input for agricultural production. Deficient N levels threatens farmers' productive capacity and potential to achieve profitability. Almost all farmers interviewed commented on the barriers to production caused by deficient N levels: "Nitrogen is the main nutrient source the corn needs. It's really leveraged high. Boy you can really lose a lot of yield fast if that corn goes short on nitrogen" (IA02). Another farmer similarly stated: "I never want to be short on nitrogen, let's put it that way. You don't want nitrogen to be your limiting factor" (IA40). Some farmers discussed their specific experiences with N loss from heavy rains: "Somebody was saying the day after this five-inch rain, 'Is there any nitrogen left?' [...] It certainly didn't help it any!" (IA23). And others specifically noted how N loss from rains could result in yield loss: "We've had a couple of situations where we had yield loss just out of... You know, we applied the nitrogen and we came in and we planted and it rained and it rained and then it rained some more" (IN16).

Farmers focused on the economic impact because they felt if they experienced N loss from heavy rains, they needed respond to it with altered management practices, or face the consequences of yield loss:

"If it keeps raining and it's warm, we're going to lose nitrogen, big time lose nitrogen, and that's when you've got to come back in and put some more [nitrogen] on or you're going to lose the crop, and there's 'why did you lose the crop?' when with another 10 to 15 gallon of [liquid nitrogen fertilizer] you can fix it" (IN14).

“We usually put [a little extra nitrogen on] just to make sure if we have a really wet year, like we had last year and how this year is turning out, that we still have some nitrogen left over [to ensure sufficient yields]” (IA09).

Like these farmers, many others interpreted heavy rain events as primarily a barrier to achieving production goals and instead of seeking to address climate change per se, were motivated to address the barriers to production it presented (see below as well).

It must be noted that some farmers were concerned about the environmental consequences of N loss from heavy rains and did not just focus on the economic barriers N loss caused. The Iowa farmer (IA09) quoted most recently above noting his concerns about N loss being a barrier to production also stated, “If it rains a whole lot, that nitrogen, some of that, will wash away and go down in the dead zone of the Gulf of Mexico” (IA09). Clearly, some farmers interpreted N loss from heavy rains outside of the purely political-economic context, but this was rare and, as the Iowa farmer’s comments together illustrate, often this interpretation was secondary and/or did not lead to pro-environmental actions (more on this below). Instead, because of their attention to the economic consequences of a climate-related heavy rain event, interviewed farmers primarily experienced the increasing occurrence of heavy rain events as a barrier to economic production, seeing this as the problem of climatic impacts, rather than humans’ causal role via production or other dimensions of environmental harm from N use.

Interpretative Relevance as a Frame for “Rational” Action

Although we are primarily concerned with how motivational relevance influences topical and interpretative relevances, we briefly illustrate here the interrelated nature of relevance systems. Interpretative relevance also influences because-motives and in-order-to motives because one’s stock of typifications used in interpretation form “the frame for any possible action he might

choose to undertake, but, more significantly, the frame for any possible rational action” (Cox 1978: 8). Farmers responded to N loss from heavy rain events by adding additional N fertiliser. Guidelines for maximising efficiency call for in-season N applications, when the crop is growing and needs the N (Robertson et al. 2013). Farmers in this sample used additional in-season applications to respond to N loss from heavy rain events. Though the exact strategies varied, the majority of interviewed farmers who had experienced N loss from heavy rain events responded by increasing N rates (32/58). Some described how they were preparing for the increasing occurrence of heavy rain events and N loss by increasing their N use overtime: “We’ve actually slowly increased [N rate] a little bit. Part of that is due to the fact that we’re raising better corn and higher yields and the other part of its we’ve had a lot wilder weather the last few years” (IA34). Another said: “[For the last 6 or so years] we have been pretty wet in May and June. And just the amount of rain we’ve had have made us add an additional 50 pounds of sidedress, just because the rain flushes it down the system” (IA02).

This is significant in terms of environmental impacts because higher N application rates are associated with more N₂O emissions from agricultural systems, further contributing to climate change (Hoben et al. 2011; Millar et al. 2010). As farmers experience the impacts of climate change, heavy rain events in this case, many are responding by using *more* N which will increase the changes of increasing heavy rain events and N loss in the future. This relationship was not acknowledged by any of the farmers interviewed, as most of them were unaware of the relationship between N₂O emissions and climate change.

In terms of water pollution, the vast majority of interviewees acknowledged that N use and loss from agriculture was a contributing factor (95/104). However, even among farmers who saw agricultural N loss as the key contributing source to water pollution issues, they generally

argued that this was an inevitable consequence of heavy rain events and the system of agriculture and thus not something they were significantly concerned about. For instance, an Iowa farmer argued that a combination of extremely dry and wet conditions had led to very high nitrate loading in the Des Moines river the year before. However, he saw the conditions, rather than farmers' practices, to be at fault: "If everyone would have only applied half their normal amount [of nitrogen], we would still have seen a high rate [of nitrates in the river]" (IA03). Another farmer similarly commented: "But nitrogen, yeah, you can lose it just because you get too much rain at the wrong time. And you do what you can to keep that from happening, but there is a limit to what an individual farmer can do" (IA08). Farmers did not question the industrial agriculture system or the practices it promotes that were causing environmental harm, nor did their knowledge lead them to seek a broader understanding of the relationship between human actions and the heavy rain events they were experiencing.

Even if farmers were making these connections, between their practices and the effects of heavy rain events, it is unlikely they could prioritise mitigation actions given the constraints of the competitive system (Schewe and Stuart 2017; Stuart and Houser 2018). Farmers' are constrained within the material motivational context of capitalism (Magdoff 2000), which likely dissuades them from considering the seriousness of the environmental consequences, including contributions to climate change and water quality. Instead, the vast majority of interviewed farmers interpreted the climate impact of heavy rain events as a barrier to production, remained entrenched in their rejection of the need to mitigate anthropogenic contributions to climate change and focused largely on responding to short-term disruptions to production to ensure profitability.

Conclusion

Returning to our guiding question – How are farmers experiencing the impacts of climate change? - our political economy of relevance approach illuminates how farmers are interpreting these events and why. Our findings indicate that political-economic pressures, like declining profit-margins, motivate farmers to be primarily concerned about the barriers to profits presented by heavy rain events and N loss. In terms of our theory, these results suggest that an underlying motive is determined by the structure of capitalist production, and the paramount project of profits it imposes, shapes the interpretative relevance of N loss from heavy rain events. Though certain environmental impacts of N loss were acknowledged, farmers primarily typified the impact of heavy rains as a barrier to production. This supports our theoretical premise: that actors' interpretations of their world are highly tied to the material, structural political-economic context in which they experience phenomena. For farmers, and the vast majority of all contemporary actors, this context is capitalist production, which shapes views of phenomena in ways that match with the logic of the system, the endless pursuit for profits.

This finding has a number of broader implications. The potential that experiencing the effects of climate change could promote the desire or openness to pursuing climate change mitigation (Arbuckle et al. 2015; Morton et al. 2017; Houser et al. 2017) overlooks the fact that there is nothing inherently present in these events that would highlight the connection between farmers' actions that emit greenhouse gases and the climate induced events they are experiencing. Instead, social context shapes how these are interpreted by many farmers and thus they remain more highly attuned to its economic consequences and these events do not result in an awareness of system-limitations and the need to mitigate climate change. These findings do not support the notion that societal responses to environmental issues emerge as the consequences related to pollution and resource degradation are experienced (Beck 1992;

Schnaiberg 1980). Instead we find that not only do capitalist demands for profit limit the use of pro-environmental practices in the agricultural sector (Stuart 2009), but the system that is structurally compelled to prioritise profit-maximisation limits the recognition of climate related events as signals for the need to pursue mitigation. Instead, farmers are primarily interpreting these events as threats to profitability and responding with practices that they believe will protect profitability, in many cases unknowingly increasing the likelihood of future heavy rain events. This finding, in part, contributes toward explaining how the majority of farmers in the US can remain skeptical of anthropogenic climate change (Arbuckle et al. 2013a, 2013b; Rejesus et al. 2013) despite evidence of their ability to accurately perceive climatic changes (Houser et al. 2017). Reflecting the social movements literature (Gamson 1992), farmers' restricted view of climate impacts is significant because farmers' awareness of the problem at an individual-level is a necessary (though insufficient) pre-condition to their pursuit of system-level change in industrial agriculture.

The interrelations of social structure and material conditions, on the one hand, and knowledge, meaning, and cognition, on the other, are long-standing interests in the social sciences (Curtis and Petras 1970: Part One; Hamilton 1973). Although we cannot fully elaborate the contributions of a more structural and critical application of social phenomenology here, through our application we find that a political economy of relevance is a sophisticated and helpful way to theorise the interaction of “ideal” and “material” factors of consciousness. Our approach allows sociological research to explain how social-structural imperatives influence thought and knowledge, without relying on strong deterministic assumptions, as well as how thought and action influence social structure. While other approaches reviewed earlier have revealed some important findings in this area of scholarship, a political economy of relevance

approach thoroughly illuminates and bridges micro-macro relationships—specifically structural economic context and individual cognition—a critical insight toward understanding (a lack of) responses to climate change.

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