Environmental Science and Policy 89 (2018) 283–291

Contents lists available at ScienceDirect

Environmental Science and Policy

journal homepage: www.elsevier.com/locate/envsci

Broadening understandings of drought – The climate vulnerability of farmworkers and rural communities in California (USA)

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ARTICLE INFO

Keywords:
Climate vulnerability
Farmworkers
Rural communities
Drought
Maladaptation

ABSTRACT

The vulnerability of food and agricultural systems to climate variability and change is extensively studied. However, the vulnerability of agricultural labor is largely ignored in climate vulnerability and adaptation studies, especially in the context of developed countries. This research examines the drought vulnerability of farmworkers both in the fields and in their communities by analyzing how changes in water resources and agricultural practices impact socioeconomic drought. A combination of surveys and semi-structured interviews with farmworkers, farmers, and social service providers in California's San Joaquin Valley is used to identify the impacts of drought on agricultural labor, water security, food security, and health. Findings demonstrate that drought impacts and vulnerabilities are multi-scalar and uneven. Agricultural drought adaptations, including increase in groundwater pumping and changes in crops, reshapes the vulnerability of farmworkers and rural communities. There is a need for continued interdisciplinary research on the socioeconomic dimensions of drought as well as increased representation of needs and vulnerabilities of farmworkers and rural communities in drought and climate change adaptation planning.

1. Introduction

The climate vulnerability of food and agricultural systems is extensively studied, with much of the literature focusing on the impacts of climate on agricultural production, farmer decision-making, and subsistence agriculture in developing countries. However, agricultural and food systems are more complex, with a broad set of actors beyond farm owners. These include farmworkers, food processors and retailers, consumers, and institutions that govern natural capital and social welfare (see Ericksen, 2008 for description of the drivers and feedbacks in this system). Each actor can be vulnerable to climate impacts and individual climate adaptations has the potential for cross-scalar impacts across the system. However, the vulnerability of farmworkers and rural communities remains largely neglected in climate vulnerability studies (Turhan et al., 2015). Though waged farmworkers make up over 40% of the world's agricultural workforce, they are not usually included in vulnerability assessments, adaptation plans, or global poverty alleviation programs (Hurst et al., 2007).

The case of the 2012–2016 California drought is an opportunity to identify socioeconomic impacts of extreme drought on farmworkers and rural communities. Agriculture dominates economic and social life in the rural communities of California's San Joaquin Valley (SJV). This research identifies the multiple impacts of socioeconomic drought on farmworkers and rural communities, including agricultural employment and indicators of well-being such as food and water security. Agriculture and water access vary between the east and west side of the SJV, which lead to a varied landscape of drought vulnerability. Considering these differences, this research identifies the socioeconomic processes and feedbacks in the agricultural system that shape differential drought vulnerabilities of farmworkers and rural communities.

This paper is organized as follows. Section 2 connects the literature on socioeconomic drought in agricultural systems in developed countries with the scholarship on climate vulnerability. Section 3 describes the study area and the case study of the 2012–2016 drought. Section 4 summarizes the methods for data collection, including semi-structured interviews and a household survey. In Section 5, data results on the impact of the drought on agricultural employment and well-being are presented. Section 6 discusses these results in the context of socioeconomic drought and differential vulnerability. Finally, Section 7 concludes the paper with policy recommendations.

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https://doi.org/10.1016/j.envsci.2018.08.002
Received 16 May 2018; Received in revised form 1 August 2018; Accepted 1 August 2018
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2. Literature review

2.1. Socioeconomic drought in agricultural systems

While droughts are coupled environmental and social events (Wilhite and Glantz, 1985; Redmond, 2002), socioeconomic impacts of drought remain a relatively neglected dimension of drought monitoring and planning, which traditionally emphasizes biophysical indicators of drought such as precipitation and soil moisture (Lackstrom et al., 2013; Bachmair et al., 2016). The lack of attention to socioeconomic drought impacts contributes to a disconnect between scientific monitoring of drought and how droughts are experienced locally (Bachmair et al., 2016). For example, Goldman et al. (2016) demonstrate the difference between the droughts identified and monitored by scientists and policymakers and the droughts identified by Maasai herdsmen, with significant implications for drought relief depending on whose drought is deemed official.

The existing research on socioeconomic drought pays little attention to the processes that shape socioeconomic drought impacts, primarily focusing on identifying economic losses in the developed world (Kallis, 2008). In agricultural systems, this means that drought impacts on the farming community are not as well understood as drought impacts on crops (Head et al., 2011). The existing research on socioeconomic drought in agriculture focuses primarily on male farmers (Vins et al., 2015), and ignores many other groups involved in the larger food system. Notable exceptions to this include Furman et al.'s (2014) work on how historical legacies challenge drought risk management for African American farmers in the American Southeast, as well as Vásquez-León's (2009) research on the drought vulnerability and marginalization of Hispanic farmers and farmworkers in the American Southwest due to lack of access to public resources. Villarejo's research in California's Central Valley highlights the impacts of reduced water supplies and land fallowing on employment of farmworkers and rural communities (Villarejo, 1996, 2004). In addition to identifying socioeconomic drought impacts, Vásquez-León and Villarejo's work are notable for analyzing climate impacts on farmworkers, who face barriers in coping and adapting climate hazards (Burke et al., 2012; Orozco, 2010) and remain largely overlooked in studies of climate vulnerability.

The existing research on socioeconomic impacts of drought in agricultural systems highlights the need for social science and qualitative research methods that reveals local impacts and vulnerabilities that are not readily identified through census or economic data (Meadow et al., 2013; Tánago et al., 2016). Using qualitative approaches to identify local drought impacts in vulnerable communities is an important step in creating drought policies that responds to local impacts and needs (Ferguson et al., 2016).

2.2. Climate vulnerability

In addition to identifying socioeconomic impacts from extreme climate, it is also important to identify the environmental, social, and economic processes that make some groups more vulnerable than others to climate hazards. The concept of vulnerability emerges from multiple disciplinary traditions, including natural hazards, political ecology, and development studies (Adger, 2006; Eakin and Luers, 2006; O'Brien et al., 2007). This scholarship grew exponentially as the problem of climate change gained attention and vulnerability was identified as a major theme for the Intergovernmental Panel on Climate Change (IPCC). The IPCC defines vulnerability as the "propensity or predisposition to be adversely affected" by climate, which is a function of exposure, sensitivity, and adaptive capacity (IPCC, 2014, p. 1775). There are multiple approaches to identifying vulnerability within this framework. The natural hazards approach focuses on identifying climate risks, impacts, and the geographic and temporal distribution of such hazards – therefore seeking to answer the what, where, and when of vulnerability (Eakin and Luers, 2006). Political ecology and political economy approaches to vulnerability focus on "why are people vulnerable or at risk," and why certain groups of people experience climate differently (Ribot, 2011, p. 1160). Such research examines the political, social, and economic processes that explain why groups of people experience different impacts and capabilities to recover from climate threats.

A critical aspect of climate vulnerability of agricultural systems is understanding the socioeconomic and environmental drivers and feedbacks that lead to impacts at multiple scales across both time and space (Ericksen, 2008). One of the processes through which vulnerability changes over time occurs when adaptation actions to reduce vulnerability increases the vulnerability for those taking adaptation actions or for other social groups (Burton, 1997). Such adaptation actions, or maladaptations, can disproportionally burden the most vulnerable (Barnett and O'Neill, 2009). This redistribution of climate risk and vulnerability often accumulates among marginalized groups by increasing exposure and sensitivity or by decreasing adaptive capacity (Juhola et al., 2016; Warner and Kuzdas, 2016). Yet, climate risk redistribution continues to be overlooked in climate adaptation planning, highlighting the need for more empirical research on the redistribution of climate vulnerability onto vulnerable groups who are often excluded from climate adaptation planning (Atteridge and Remling, 2018)

The vulnerability literature is also paying greater attention to analyzing the impacts of climate at the individual and household scale, focusing on the non-economic dimensions of well-being (Adger et al., 2009; Graham et al., 2013; Tschakert et al., 2017). Feminist political ecology highlights the ways in which risk and vulnerability are experienced at the scale and materiality of the human body and in micropolitics of resource use and management (Elmhirst, 2011; Truelove, 2011). These experiences of vulnerability and well-being remain underexamined in drought literature and can inform new ways to identify and respond to drought impacts.

3. The case study: the 2012–2016 California drought

California's SJV is a prolific agricultural region in the United States. Two counties in the valley, Fresno and Tulare, are the highest ranked in the country in agricultural sales (Fig. 1). This agricultural productivity is supported by a combination of surface and groundwater for irrigation. The surface water is primarily sourced from Sierra Nevada snowmelt through a complex series of state and federal canals.

While many SJV agriculture statistics are aggregated across the valley, there are significant differences between the "west side" and the "east side" of the valley. Surface water distribution for each side of the valley is managed by different irrigation districts, with the west primarily managed by the Westlands Water District and the east managed primarily by the Friant Water Authority. In the past, the east side has predominantly grown permanent crops such as citrus and fruit, while the west side has grown many annual crops such as tomatoes and field crops such as cotton. Over the last decade, there has been an increase in the production of fruit and nut crops across the valley.

Rural communities in the SJV are predominantly inhabited by farmworkers who work at crop harvesting and fruit packing plants. Approximately 68% of farmworkers in the region were born in Mexico, and circa 47% lack work authorization (Hernandez et al., 2016). These low-income communities have limited access to health and education (Lewis and Burd-Sharps, 2014). Additionally, these communities experience high food insecurity (Wirth et al., 2007) and water insecurity due to lack of investments in rural water infrastructure (Carillo, 2014; Gasteyer et al., 2016).

Beginning in 2012, California experienced the most severe drought in the last 1200 years (Griffin and Anchukaitis, 2014). The impacts of the drought across the state was highly uneven, leading Swain (2015) to call it a "tale of two California droughts," where impacts were mild along the highly-populated coast and severe in rural agricultural areas (p. 9999). During the drought, surface water allocations were

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