



# Public health science in agriculture: Farmers' perspectives on respiratory protection research



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## ABSTRACT

Although agriculture in the US is now firmly rooted in scientific investigation, farmers were dismissive of agricultural science for many decades. Currently, there is a well-established body of scientific evidence related to occupational hazards on farms, as well as strategies to mediate them. However, rates of injuries and illness remain higher in agriculture than almost any other industry. This paper, based on in-depth interviews with poultry producers in Texas, suggests that farmers are not receptive to health and safety research in agriculture. They do not trust researchers' agendas, they fear that there will be negative economic consequences, and they do not agree that the questions asked by safety and health researchers are scientifically valid. As a result, agricultural safety and health research resembles earlier iterations of agricultural science in which the industry is resistant to accept the validity of the research process, approach, or evidence presented.

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## 1. Introduction

Despite what appears to be a general popular consensus that decision-making should be based on scientific evidence, the acceptance and adoption of scientific principles by the general public has been uneven and fraught with controversies. The current dialogue about climate change provides one notable example (Lewandowsky et al., 2013). Even in realms where science appears to be foundational, such as in US agriculture, a closer read of agricultural history shows that the relationship between agricultural scientists and farmers has been slow to develop and the two populations have often been at odds with each other. The current iteration of agricultural science has bridged the perspectives of scientists and farmers by emphasizing efficient production based on chemical inputs, biotechnology, and specialized equipment.

When public health science addresses agriculture, the focus is typically food access, nutrition, or the environmental impact of farming practices. However, the past three decades have also seen a growing body of research examining occupational safety and health outcomes of agricultural populations (DeRoo and Rautiainen, 2000). Agricultural workers experience high rates of occupational

fatalities, injuries, and illnesses. The Bureau of Labor Statistics reports that an agricultural worker is more than seven times likely to die on the job than workers in other industries. Agricultural workers also experience high rates of chronic illness related to their occupation, including musculoskeletal disorders, skin and lung disease (Lessenger, 2006; Donham and Thelin, 2006). There has been a response by both public health researchers and federal agencies over the past decades to improve these rates; however, agriculture has been much slower to change than other industries and in fact fatalities among agricultural workers has increased in recent years (CFOI Macken-Walsh (2016)).

This paper examines qualitative data collected from broiler chicken producers in the southeastern US to better understand their barriers to participating in health and safety research on farms. The study was developed in response to a lack of participation by broiler producers in an educational intervention to increase respirator use among those working in the production barns. While some researchers have examined barriers to changing safety and health behaviors on farms, there is little attention to producers' willingness to participate in the research that supports occupational safety and health interventions in agriculture.

## 2. Science in agriculture and public health

The merger of science and agricultural knowledge into what we

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now know as “scientific agriculture” in the United States has a long trajectory. For much of agriculture’s history, the bulk of experimentation, change and knowledge rested with farmers who perfected plant varieties, selectively bred livestock, and observed optimal soil and environmental conditions for production. In the 1860s, the new field of soil chemistry spread, as scientists trained by Justus Leibig returned to the US to apply their new knowledge (Danbom, 1986). In the US, the federal government expanded the development of the land-grant university system in the form of the Morrill Act of 1862, and again later with the 1887 Hatch Act and 1914 Smith-Lever Act. These established, respectively, agricultural experiment stations for research and the infrastructure for a network of county extension agents whose role was to disseminate the findings from the university and experiment station research (Hassanein, 1999).

Despite these investments, it was not until the middle of the 1900s that agricultural science became normalized in rural communities (Buttel, 1993). Earlier populist movements among farmers railed against perceived exploitation by lenders, railroads, input dealers and others, including federally funded research programs (Hassanein, 1999, 13). Although farmers were resistant, the national focus on science and productivity made the romanticized agrarian traditions of the past less palatable for a more urbanized society. Farmers were now judged by their productive capacity, rather than their connection to the land. The embedding of scientifically derived knowledge into agricultural practices was a slow process, hampered both by farmers, who deplored “book learning,” as well as other scientific fields, which were critical of the practical focus of agricultural research (Danbom, 1986).

Some have characterized the slow pace with which scientific knowledge gained legitimacy as reflecting the competing values of ordinary, folk, or indigenous knowledge and new realms of scientific knowledge which were, at times, oppositional to traditional or religious knowledge (Kloppenborg, 1991; Buttel, 1993). Likewise, this tension played out in agriculture as agricultural scientists slowly gained legitimacy in the eyes of farmers, policy makers and, most significantly, business interests. This culminated into what Fredrick H. Buttel has deemed a “productionist ideology, the doctrine that increased production is intrinsically socially desirable, and that all parties benefit from increased output” (1993:7). A productionist ideology provides a point of confluence for farmers, scientists, agribusinesses, policy makers, and others in that all parties can align in support of increased agricultural outputs.

A productionist approach to agriculture is further entrenched as other technological advances continue to make the practice of farming more complex (Bye and Fonte, 1993). The introduction of chemical fertilizers, hybridized, or more recently genetically modified, seeds, veterinary techniques, precision application, and other practices embed agriculture firmly in the realm of science and technology, rather than local, indigenous or “folk” knowledge.

As science has been embraced by agriculture, it has also legitimized agricultural practice. This can be seen most clearly in organic and alternative production. As science becomes a legitimate form of knowledge generation in agriculture, those farming practices that are vetted scientifically also gain legitimacy. Michael S. Carolan (2006a) has written about this exchange, as it relates to trust, noting that mainstream agriculture, with its basis in science, was trusted by policy makers, whereas alternative practices were seen as “emotional” or “irrational.” Ultimately, “by drawing on the public’s trust of science, it appears that sustainable agriculture has been able to concomitantly attain a degree of truthworthiness that previously had been lacking” (2006:331).

Public health science has its own trajectory and set of

controversies in which the public diverges on the scientific merit of, for example, climate change or vaccinations (Patil, 2011). Public health science has become foundational in the identification, evaluation and control of occupational health and safety hazards (Murphy et al., 1990). Scientific methods employed in public health research are foundational to the fields of epidemiology, exposure assessment, injury and illness prevention and behavioral health. These methods are used to identify and mitigate occupational hazards experienced by workers in agricultural sectors. Much of the public health research is funded by the National Institute for Occupational Safety and Health (NIOSH), part of the Center for Disease Control and Prevention (CDC), which then provides recommendations for best safety and health practices in occupational settings. NIOSH recommendations may inform regulatory action enforced by the Occupational Safety and Health Administration (OSHA). However, unlike other industries, many American farms are exempt from OSHA inspections because they employ fewer than 11 non-related persons per year. Furthermore, the creation of new OSHA regulations has historically been a slow process and requires substantial scientific evidence and political support.

In 1990, following a sentinel publication “Agriculture at Risk, a Report to the Nation” (Merchant et al., 1989) funding was appropriated to create research centers with a mission to generate knowledge on injury, illness and fatality prevention among agricultural workers. The NIOSH Agricultural Centers were established as part of a CDC/NIOSH Agricultural Health and Safety Initiative to conduct research, education, and prevention projects that address the nation’s pressing agricultural health and safety problems. Geographically, the Centers are distributed throughout the nation to be responsive to the agricultural health and safety issues unique to the different regions. These centers were the first federally funded efforts to focus exclusively on agricultural safety and health, adopting a public health perspective unique in scientific research related to agriculture.

The heightened attention to agricultural injuries and fatalities has resulted in more than 30 years of intervention efforts by the NIOSH centers and others. Attempts to understand why agriculture remains such a dangerous occupation have largely focused on farmers’ knowledge and attitudes about occupational hazards (Murphy, 1981) or safety behaviors among farmers (Yavuz et al., 2014). Some have also focused on the difficulties of providing services, or oversight, to the farming community, which is rural, often isolated, and highly dispersed (Sandfort, 1990). In some cases, researchers have taken a participatory approach, employing social networks to promote safer behaviors (Stave et al., 2007; Schiller et al., 2010). Despite the investments in education and interventions, most farm safety endeavors are not well evaluated, and tend to emphasize changes in knowledge or attitudes, rather than measuring changes in actual injury rates (DeRoo and Rautiainen, 2000). To our knowledge, there have not been any previous studies specifically relating to farmers’ perceptions or engagement in public health research; thus, this issue is even less well understood than safety and risk taking behaviors. Given the focus in public health on evidence-based approaches, it is important to evaluate the extent to which farmers are receptive to public health research. Our aim here is to examine how one cohort of farmers views public health research that focuses on respiratory protection.

### 3. The burden of lung disease in poultry production

Lung disease among agricultural workers has been recognized for some time, and estimates suggest that nearly 1,000,000 agricultural workers are at risk for lung disease (Clark et al., 1983;

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