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The Oil and Gas Boom: Basic Information About Oil and Gas Activities for Extension Professionals

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The Oil and Gas Boom: Basic Information About Oil and Gas Activities for Extension Professionals

Abstract

This article provides basic information for Extension professionals about oil and gas exploration and extraction. Information about hydraulic fracturing, land application of drilling mud, potential community outcomes, and Extension education opportunities are discussed. Family and Consumer Sciences (FCS), Community and Rural Development, and Agriculture Extension state and field staff can use this basic information to help plan successful programming. The issues associated with oil and gas activity have potential impacts on audiences of Extension education. A companion article frames these topics as a public issue for Extension.

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Introduction

Oil and gas activity, specifically hydraulic fracturing, has become a controversial economic issue that Extension educators may find themselves engaged in on the community level. In this case, the "tool of the trade" is research-based content that introduces Extension to some oil and gas technologies.

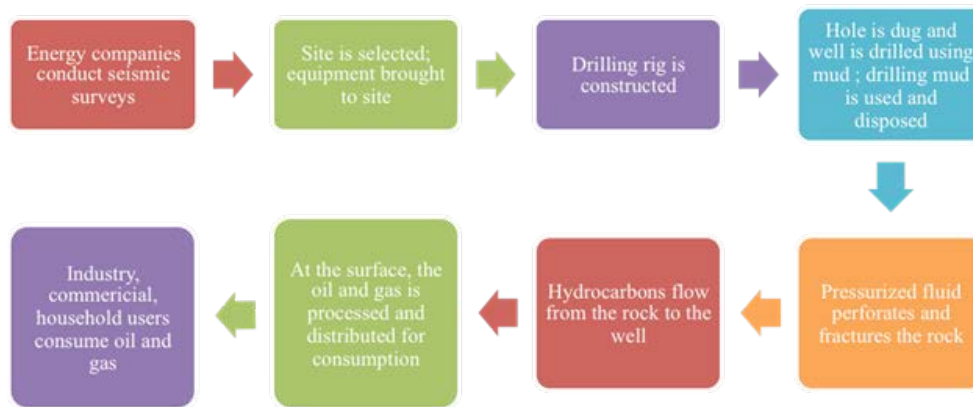
Oil and Gas

Hydraulic fracturing (also known in the press as hydrofracking, fracking, or fracing) is a technique used to release oil and gas from low-permeable geologic formations that would otherwise be difficult to extract (Cipolla, Lolon, Mayerhofer, & Warpinski, 2009). Recent advances have made the release of locked oil and gas even more feasible.

The Process of Exploration, Extraction, and Distribution

Figure 1. provides a simplification of the process of releasing oil and gas (Halliburton, 2014).

Figure 1.
Simplified Process Diagram



Why Do We Care?

Oil and natural gas are important forms of energy (U.S. Energy Information Administration, n.d.). Oil and gas exploration and extraction is a controversial public issue that provides opportunities for Extension programming. As noted by Patton and Blaine (Patton & Blaine, 2001), public issues can be contentious and clouded by perception based on various degrees of accuracy.

Potential Costs/Benefits and Concerns

Issues and potential costs and benefits associated with oil and gas exploration and extraction can be grouped as follows: (1) Environment; (2) Water quality; (3) Water quantity; (4) Air quality; (5) Waste; (6) Liability, and (7) Community and landowner (Ferrell & Sanders, 2013a, 2013b).

(1) Environment

Potential or claimed environmental impacts may include but are not limited to competition for clean water, waste disposal methods, correlation with earthquake activity, habitat destruction, and soil/air/water quality issues. Additionally, there is a more generic concern with the implied effect of prolonged dependence on fossil fuels on the environment.

(2) Water Quality

Surface water and groundwater may be contaminated during hydraulic fracturing. Surface water is at greater risk of contamination, as it is more likely that accidental discharge of fluids at the surface will contaminate surface water and soils (Adams, 2011). Groundwater contamination risk depends on two factors: (1) Depth of the groundwater and (2) Rock formation being explored.

(3) Water Quantity

Hydraulic fracturing requires large quantities of water. The US Department of Energy estimates that between 2 to 4 million gallons of water are needed to produce a single horizontal shale gas well (U.S. Department of Energy, 2009).

(4) Air Quality

Hydraulic fracturing may potentially impact air quality. Activity may release "methane, volatile organic compounds, and hazardous air pollutants" (U.S. Environmental Protection Agency, 2014).

(5) Waste

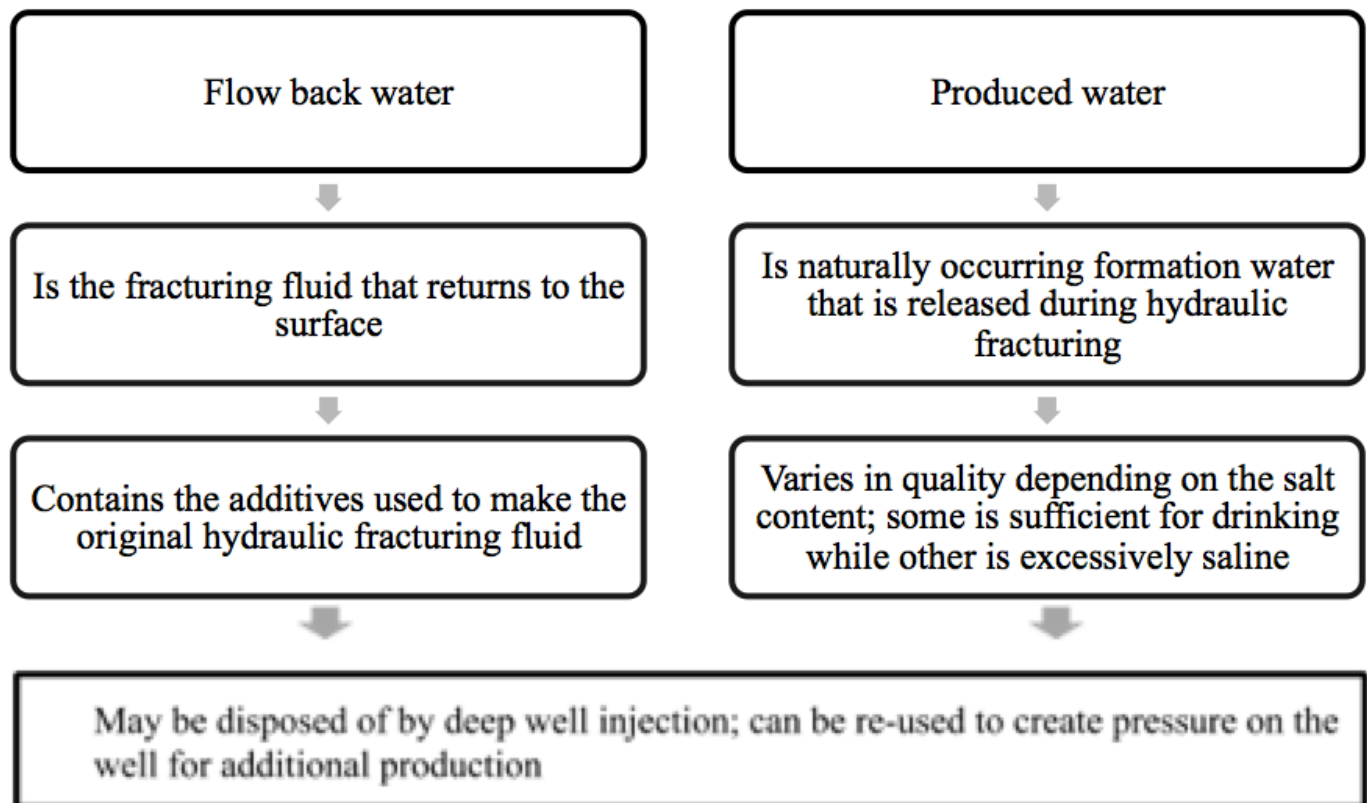
Drilling produces a large volume of waste that must be properly stored and disposed. The two main waste products are fluids and drilling mud.

Fluids

A typical well can release millions of gallons of flow-back water and produced water (U.S. Environmental Protection Agency, 2012). Disposal is critical; a common solution is deep-well injection (Clark & Veil, 2009). This has been correlated with earthquakes in some

areas (Sumy, Cochran, Keranen, Wei, & Abers, 2014). Figure 2 provides information on fluids waste.

Figure 2.
Fluid Waste Diagram



Drilling Mud

Drilling mud is used to protect the bit during operation and remove cuttings from well and is disposed of through burial and land application. Land application of drilling mud is highly regulated by state agencies (Penn & Warren, 2014; Penn & Zhang, 2013).

(6) Liability

There are a number of questions under current state and federal environmental laws. Exemptions for practices related to hydraulic fracturing raise questions about compensation for damages caused by resource extraction activities and encourages the litigation process. Some have called for modification or removal of exemptions and exceptions under various federal statutes. How the legal system handles the impacts of petroleum resource extraction remain a significant part of hydraulic fracturing activity.

(7) Community and Landowner

Some factors may affect the protection and enhancement of community well-being. Communities and Extension must understand that there may be unplanned and unexpected activities associated with oil and gas and activity.

Boomtown

Some communities experience a boomtown effect when oil and gas activity is increased. Communities may be challenged by the boom, boom contraction, and post-boom phases associated with increased activity.

Transportation

Oil and gas activity relies heavily on transportation for materials and personnel transport. For example, a typical shale well in the Marcellus play (New York, Pennsylvania, Ohio, Virginia, and West Virginia) requires 976 trucks to transport 4.88 million gallons of water to and from the well site (Chernova, 2011).

Employment and Workforce Availability

Oil and gas activity is labor and resource intense. Brown, Weber, and Wojan (2013) report that the employment of an average county with hydraulic fracturing activity increases by 3,200 jobs, 1,780 of which were mining related; the remaining jobs are created served the mining workers.

Locus of Costs and Revenues

Oil and gas activity affects infrastructure, utilities, schools, other goods, and services. Payment for these goods is a complex picture. Numerous sources provide local government revenues: sales, property, and income taxes and funds for education, healthcare, and roads. Some revenues provide specific goods and services, while others funds are unrestricted.

Other Sociological Impacts

Oil and gas activity has multi-faceted sociological impacts that may affect the quality of life for both long-term residents and newcomers. Some workers are removed from their cultural and social sanctions. Increased crime, accidents, substance abuse, and sexual abuse may be consequences of rapid population growth.

Landowner Issues

Accessing the minerals underground often involves negotiating compensation with the property rights owners. Property ownership and leasing contracts with energy companies are complex.

Conclusion

In conclusion, an understanding of the basic issues surrounding oil and gas activities will help Extension educators better serve their communities. Is your community affected by oil and gas exploration and extraction? More information will be provided in an upcoming companion article. That article frames the topic as a public issue for Extension.

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