An Unlikely Partnership: Bringing Together Agricultural Producers and Energy Developers to Solve the Nation's Looming Water Crisis

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El Niño conditions, caused by a band of warm water in the Pacific Ocean off South America, have brought much needed rainfall to many drought stricken parts of the country. According to the National Drought Mitigation Center, the rain has led to a significant reduction in the national drought footprint, from 35 percent in mid-October to 14 percent in early March. The relief could, however, be short-lived. The National Oceanic and Atmospheric Administration predicts that El Niño will weaken throughout spring, with a return to neutral conditions by early summer, and the possibility of a La Niña event in the fall. Such an event, which is generally associated with

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lower rainfall in the south and west, could have devastating consequences.

Despite the recent rain, nearly 20 percent of the south and over 65 percent of the west remains in drought. Some of the driest areas, including California and Texas, have disturbingly high water usage. Government data indicates that California and Texas use more water than any other state, each withdrawing over 20 million gallons of water per day, or 7.3 billion gallons per year. Water use is expected to rise in coming years, due to strong population growth and increasing economic activity, making supply and demand imbalances a very real possibility.

In California, drought conditions have triggered a fierce debate over water use in agriculture and other industries. Following last year's announcement of mandatory urban water restrictions, by California Governor Jerry Brown, many questioned why the restrictions did not apply to the agricultural industry, which is currently the state's largest water user. More recently, as agricultural water use has increasingly been limited, focus has shifted to other industries.

Considerable scrutiny has recently been directed towards water use in the oil and gas sector, particularly for enhanced recovery techniques such as water flooding. This technique is commonly used to increase oil production, and involves the underground injection of large volumes of water to displace oil from the pore spaces in rock, and maintain underground pressure. It is especially useful in areas with heavy, viscous oil such as the Kern Front Oil Field in the San Joaquin Valley in central California. That area has seen significant oil development in recent years. At the same time, it has also continued to support much of the state's agricultural production, raising concerns that there won't be enough water to go around.

Competition for water between agricultural producers and energy developers has also been an issue here in Texas. The growth of hydraulic fracturing, wherein water (mixed with chemicals and a proppant) is injected underground at high pressure to fracture the rock to release hydrocarbons, has led to the expansion of oil and gas activities into new areas previously dominated by agriculture.

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Many of these areas are prone to drought, leading to concerns that the oil and gas sector will take water needed by farmers. Allocating water between oil/gas and farming is seen as a "zero-sum" game, in that more water for one necessarily means less for the other. That may not, however, be the case. On the contrary, oil and gas development may actually result in increased water for agriculture.

Oil and gas development produces significant amounts of water as a by-product. This so-called "produced water" varies in quality, depending on the nature of the rock formation and the method used to extract oil and gas therefrom, among other factors. It often has a high salt content and may include other contaminants, such as arsenic, barium, calcium, chloride, lead, and magnesium. For this reason, produced water is typically viewed as a waste and disposed of, often through underground injection. However, with appropriate treatment, the water could be reused, including in agriculture.

A report, published by the Department of the Interior's Bureau of Reclamation, indicates that "[p]roduced water could be used to augment conventional water supplies for use in irrigation and livestock watering." Prior to such use, the water may require treatment, to reduce its salt content. Research suggests that most crops do not tolerate high levels of salt and sustained irrigation with salty water can damage soils. Similarly, livestock that ingest water with too high a salt content may develop health problems. Livestock can, however, tolerate water of lesser quality than humans. Water with total dissolved solids ("TDS") up to 10,000 milligrams per liter (mg/L) is suitable for most livestock, except poultry (which require TDS less than 5,000 mg/L) and swine (which require TDS less than 7,000 mg/L). (In comparison, the TDS of water intended for human consumption must not exceed 500 mg/L.)

According to the Bureau of Reclamation, 18 percent of conventional and 88 percent of unconventional oil and gas wells produce water containing under 10,000 mg/L TDS, the maximum acceptable for livestock. Notably however, some produced water may contain minor ions, including arsenic, boron, chromium, and lead, at levels exceeding those considered safe for livestock. Such water will require treatment prior to re-use. The required treatment will vary, depending on the starting quality of the water, as well as the

desired level of purity. As livestock do not require highly pure water, treatment can often be performed using simple, inexpensive processes.

Given this, produced water may be a useful resource for the agricultural industry, particularly in drought-prone areas. This is not to say that re-using produced water for agriculture is without risks. Concerns have been raised about whether re-use may expose humans to harmful constituents. Little is currently known about the extent to which different contaminants bio-accumulate in meat, eggs, and dairy products and what the human health impacts of this are. Wisely then, produced water is not currently re-used for livestock watering. With the looming water crisis, however, surely it is time we investigated the risks associated with re-use so that, if it is safe, full utilization can be made of this valuable resource.

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