Who Pays the Cost of Water Pollution and Depletion?[1]

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Whenever streams and groundwater are polluted with wastes or are depleted through overuse, someone has failed to pay the cost of pollution prevention and water conservation. Failures to protect and preserve our precious water resources impose costs on the whole of society, including on those of future generations who will be as dependent on adequate supplies of clean, fresh water as we are today. Ultimately, we all pay the costs of water pollution and depletion. People continue to pollute and waste water because they expect to receive more economic benefits than any costs society might force them to bear.

Some of the obvious economic costs of water pollution include reduced recreational value of rivers, streams, and lakes, including boating, fishing, and swimming; diminished value of commercial fishing in streams, estuaries, and oceans; and the lost use of private water wells due to chemical and biological contamination. Restrictions on eating fish caught in major U.S. rivers and lakes and huge "dead zones" in the Gulf of Mexico, Chesapeake Bay, and elsewhere attest to the broad scope of water pollution. Much of the pollution arises from "point-sources," typified by manufacturing and other activities in the industrial sectors of the economy. The primary "non-point" source of surface water pollution in the U.S. has been identified as our so-called modern industrial agriculture. Overuse of chemical fertilizers and pesticides in crop production and land application of manure from concentrated animal feeding operations (CAFOS) are prime examples of pollution from industrial agriculture. Such sources are called non-point because contaminants are picked up by water flow or infiltration over broad areas of land rather than from a specific point of discharge.

The economic costs associated with any given source of water pollution are often difficult to measure because a variety of different sources frequently contribute to the pollution of specific streams and aquifers. In addition, human health risks associated with non-point source pollution are particularly difficult to measure. However, an inability to isolate and measure the specific costs does not diminish the negative impacts of water pollution on society. For example, the increased health care costs associated with the use of antibiotics and hormones in CAFOs may well exceed the any possible economic benefit from feeding animals in large, confinement operations. An outbreak of E-Coli caused by drinking water polluted by a CAFO, which has happened, may impose a far greater economic costs in the individuals who are sickened or die from drinking polluted water than any economic benefit they might conceivably receive from lower food costs.

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The CAFO operators responsible for such instances of pollution have good reason to believe they won't have to pay for the costs of their pollution, so they continue to pollute. Only rarely can illnesses associated with non-point source pollution be traced to a specific operation or operator. It is also difficult to isolate the portion of increased healthcare costs associated with a specific type of agriculture, such as CAFOs. In addition, those who benefit economically from operating CAFOs have vigorously challenged the numerous scientific studies by credible public health institutions linking public health risks to CAFOs.[i] They claim the results of such studies are "inconclusive," and they counter with industry initiated or sponsored studies that raise doubts because of the inherent difficulties in linking specific causes and effects in such cases.

Obviously, there are many sources of water pollution other than agriculture. Fortunately, most of the point-sources of pollution are easily identified and are regulated by the EPA and other government agencies, even if not always effectively. Agriculture has remained "under-regulated," or completely unregulated in many cases, in spite of a large and growing body of scientific evidence linking persistent pollution of streams and groundwater to agricultural operations. The exemption of agriculture from most environmental regulations has been defended by an assumption that nature is capable of absorbing and neutralizing agricultural wastes because agricultural wastes are dispersed over wide areas of land, rather than concentrated in specific locations. Historically, dilution by dispersion had proven an adequate preventative or mitigant for agricultural pollution. However, today's modern industrial agriculture is fundamentally different from agricultural production systems of the past and have very different consequences with respect to pollution.

Water *depletion* may be an even more important concern than water pollution in the not-too-distant future. By some estimates, more than one-half of all "fossil water" on earth has already been extracted for human use – fossil water meaning water in non-recharging or slow recharging aquifers.[ii,iii] Many free-flowing rivers, such as the once-great Colorado River, have been reduced to a trickle by growing demands for municipal drinking water and irrigation of agricultural crops.[iv] When streams dry up, water levels in municipal drinking water reservoirs drop, and residents are forced to ration water use until supplies can be replenished. With global climate change, instances of drought and water rationing are likely to be far more common.

As with water pollution, society bears a disproportionate share of the costs of water depletion, while economic enterprises reap a disproportionate share of the economic benefits. Industry accounts for about 60% of total water use.[v] More than 90% of industrial use for mining, including the 9% used for mining sand and gravel. Turf grass production accounts for 13% of the industrial total. Agriculture claims 30% of total water use, less than total industrial use, but almost three times as much as the 11% used for municipal drinking water and more than twice as much all industrial uses excluding mining and turf grass production.

The major agricultural use of water is for irrigated crop production, however, CAFOs also are large water users. Dairy CAFOs, by some estimates, require 2,000 gallons of water to produce a gallon of milk, counting the water used to produce the feed for dairy cows. It takes about 600 gallons of water to produce a single hamburger. With the exception of irrigation from public sources of surface water in the West, agricultural water use for industrial crop and livestock production is largely unregulated. Again, agriculture seems to be largely exempted from water conservation and stewardship responsibilities, apparently because use of water to produce food is considered a normal and necessary economic activity.

Regardless of the reasons, agriculture has been largely exempt from paying an equitable share of the costs of water pollution and depletion. The large and growing costs have been paid by society. The Clean Water Act of 1972 instituted government regulations to protect water from industrial pollution. These regulations, while far less than perfect, significantly reduced industrial water pollution. In the meantime, agricultural pollution has continued to grow with the growing industrialization of American agriculture. American agriculture is no longer characterized by the dispersed and diverse family farms of earlier times. More than 80% of America's agricultural production comes from large, industrial grain and livestock production facilities. These industrial agricultural operations are far more like factories than farms and quite logically should be regulated as such. Lacking such regulation, society has no means of controlling the large and growing costs of water pollution and depletion.

There were, and still are, good reasons for exempting "authentic" farming operations from most environmental regulations. Specific violations should be addressed, regardless of source, but there is no reason to expect widespread water pollution or depletion from "real farms." Industrial agriculture is not authentic farming. Large commercial crop and livestock operation are not real farms. The dominant characteristics of industrial operations are specialization, standardization, and concentration or consolidation of control. Real farms are diverse, individualistic, and dispersed or decentralized in control. Industrial agricultural operations function much like factories, their fields and feedlots functioning as biological assembly lines.

The negative impacts of industrial agriculture on water quality and quantity are inherent in the concentration of production that arises from their specialized, standardized, consolidated structure. Without concentration of production, industrial crop and livestock would not be able to achieve the short-run economic efficiencies that allow them to compete with authentic farming operations, such as organic farming and other approaches to farming sustainably. The problem is inherent in their industrial organizational structure.

In modern organic/sustainable farming, the limiting factor of production generally is the amount of nutrients released annually from the chemical and biological fractions of healthy, productive soils. Farmers then have an economic incentive to make sure they apply sufficient quantities of other inputs, including labor and cultivation, to allow maximum economic production from the limited nutrients available. Under such conditions, few nutrient, which in excess are pollutants, are left to flow or leach into streams or groundwater. In addition organic/sustainable farmers rely on cultural practices, rather than water polluting pesticides, to control weeds and insects.

In industrial agricultural operations, the limiting factor generally is land or space to grow crops; nutrients are readily available in the form of commercial fertilizers. This provides an economic incentive to concentrate too much production on too few acres of land. Industrial producers have an economic incentive to over-apply fertilizers and pesticides in order to ensure maximum economic yield per acre of land. For example, even if nitrogen fertilizer costs $1.00 per pound of N, there is an incentive to over-apply nitrogen to ensure maximum economic yields. In general, one additional pound of nitrogen per acre is capable of adding about one bushel per acre to corn yields. However, other growing conditions, including rainfall and temperatures, have to be ideal to support the maximum yield response from additional nitrogen. If corn prices are $5.00 per bushel, the industrial producer has an economic incentive to apply nitrogen for favourable growing conditions that will be realized only one year out of five. Because of the 5-to-1 price ratio, the payoff in the single best year will compensate for the other four years when yields failed to reach their full potential. As a consequence, four out of five years, excess nitrogen will be left in the field to pollute streams and groundwater. The same basic principle provides an economic incentive to over-apply pesticides as well. The economic incentive to pollute is inherent in the industrial system of agricultural production.

Large-scale confinement animal feeding operations also have an inherent economic incentive to pollute. CAFOs concentrate too many animals in confined feeding facilities to allow for the nutrients contained in their manure to be returned to the fields were the crops were grown to produce their feed. As manure is transported to increasingly distant locations, the cost of manure disposal eventually exceeds its economic value as fertilizer. Thus there is an economic incentive to over-apply manure near the feeding facility, even in excess of maximum economic fertilization rates, which inevitably results in water pollution. Other chemical and biological contaminants enter streams and groundwater along with the excess nutrients.

Industrial agricultural operations have economic incentives to deplete surface and ground water resources as well. The concentration of production needed to achieve economic efficiency concentrates the use of water in production areas far too small to be replenished by rainfall. In organic/sustainable farming, crops and livestock are dispersed across the land in relation to the water replenishment capacity of nature. Over time, the use of water for irrigation and CAFOs deprive residents of surrounding areas of the quantity, as well as quality, of drinking water they need to support healthy, active lifestyles. Industrial agriculture reaps the economic benefits but the surrounding communities pay the costs.

Industrial agriculture is not sustainable. It simply is not capable of meeting the needs of society today and most certainly is not leaving equal or better opportunities for those of the future. Neither is it necessary to provide for the food needs of current or future generations. Contrary to popular belief, smaller, more diverse, and dispersed crop and livestock farm are meeting the needs of more than 70% of the global population today. With a transition away from industrial agriculture, such farms would capable of meeting current food needs of society without diminishing opportunities for the future, and without polluting or depleting the precious water resources upon which all generations must depend. Eventually, industrial agricultural operations, such as CAFOs, must be replaced by more sustainable systems of farming.

In the meantime, CAFOs and other industrial farming systems should be regulated as any other industry. They pollute and deplete water in the same ways that factories pollute and deplete and should be regulated as such. For example, a 1,000 head dairy CAFO used about as much water as 1,000 people, a significant draw from an aquifer, but generates as much chemical and biological wastes as a city of 20,000 to 50,000 people, depending on the specific contaminant considered to be most critical.[vi] Regulations that allow the wastes from a 1,000 cow dairy CAFO to be stored in pits or open storage ponds and spread on surrounding farms are simply not adequate to protect public health. Bio-digesters are designed to produce methane, not sterilize animal waste. Digesters may reduce biological contaminants but do not to levels necessary to protect public health. Nothing less than a multi-stage, municipal waste treatment facility will adequately mitigate the risks. The public health risks associated with water polluted by CAFOs are inherent in their industrial structure of organization.

Who pays the cost of water pollution and depletion? The people. The investors in industrial agriculture, including the large corporate agribusinesses that encourage and support them, reap the economic benefits of their inevitable pollution and depletion of water; the people in surrounding communities and in society in general ultimately pay the costs.

End Notes:

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[i] Johns Hopkins Bloomberg School of Public Health, "Agriculture and Public Health Gateway," Industrial Food Animal Production, http://aphg.jhsph.edu/?event=browse.subject&subjectID=43

[ii] Judith S. Soule and John K. Piper, *Farming in Nature's Image, An Ecological Approach to Agriculture*, (Washington, DC: Island Press, 1992).

[iii] Fred Kirschenmann, Cultivating an Ecological Conscience, (Berkeley, CA: Counterpoint, 2010).

[iv] Ken Midkiff, *Not a Drop to Drink*, (Novato CA: New World Press, 2007).

[v] World Water Assessment Programme, *Water and Industry,* http://webworld.unesco.org/water/wwap/facts_figures/water_industry.shtml .

[vi] Ron Fleming and Marcy Ford, "Human versus Animals - Comparison of Waste Properties," Ridgetown College - University of Guelph July 4, 2001, http://www.ridgetownc.uoguelph.ca/research/documents/fleming_huvsanim0107.PDF .