

# FACT SHEET: Ethanol Biorefineries

## Ethanol Basics

95% of ethanol is produced from corn.<sup>1</sup> 17% of the U.S. corn crop and 26% of the sorghum crop went into ethanol production in 2006.<sup>2</sup> The U.S. annually consumes 142 billion gallons of gasoline<sup>3</sup> and is now producing a record 6.6 billion gallons of ethanol.<sup>4</sup> The Energy Policy Act of 2005 mandates production of 7.5 billion gallons per year by 2012<sup>5</sup> and a proposed “renewable fuels” law would create an impossible goal of 15 billion gallons by 2022. Achieving this will require 34 million acres – over a third of the current corn acreage in the U.S. This is spawning a massive growth in proposals for noisy,<sup>6</sup> polluting ethanol biorefineries, but will do little to cut oil imports. A 1997 congressional report concluded, “ethanol’s potential for substituting for petroleum is so small that it is unlikely to significantly affect overall energy security.”<sup>7</sup>

As of October 2007, there are 131 ethanol plants in operation, 10 being expanded and 73 more under construction.<sup>8</sup> A total of about 200-300 are proposed.<sup>9</sup>

## Industrial Agriculture

Of all crops grown in the U.S., corn demands the most massive fixes of herbicides, insecticides, and natural gas-based fertilizers, while creating the most soil erosion.<sup>10</sup> 73% of U.S. corn is genetically engineered.<sup>11</sup> Ethanol is increasingly derived from biotech corn varieties.<sup>12</sup>

Biotech corn comes in two main varieties: one where the corn produces Bt toxin to kill the European corn borer, and one that enables the corn to withstand higher doses of commercial herbicides like Aventis’ Liberty or Monsanto’s Roundup, causing more herbicide to be used.<sup>13</sup> Roundup has been found to be more toxic than previously thought – being highly lethal to amphibians.<sup>14</sup> Both Bt and herbicide-resistant corn can lead to the development of resistance in bugs and weeds, a problem with virtually all chemical pest control methods. Bt is a soil bacteria used as a pesticide of last resort by organic farmers. Bt resistant bugs are a major problem for organic farmers. Both methods also risk genetic pollution, spreading the biotech attributes to nearby crops, wild relatives or weeds.<sup>15,16</sup>

Meeting the lifetime fuel requirements of just one year’s worth of U.S. population growth with straight ethanol (assuming each baby lived 70 years), would cost 52,000 tons of insecticides, 735,000 tons of herbicides, 93 million tons of fertilizer, and the loss of 2 inches of soil from the 12.3 billion acres on which the corn was grown.<sup>17</sup> The U.S. only has 2.263 billion acres of land and soil depletion is already a critical issue. Soil is being lost from corn plantations about 12 times faster than it is being rebuilt.<sup>18</sup> Wetlands are being drained to produce surplus corn. The Corn Belt has already lost about 70% of its wetlands.<sup>19</sup>

## Energy (in)Security

Ethanol is promoted in “energy security” terms, yet our ability to grow corn is now dependent on foreign sources of nitrogen-based (ammonia) fertilizers that are created using large amounts of natural gas. As North America runs out

of natural gas, prices have tripled in the U.S. since 1999.<sup>20</sup> Between 1991 and 2006, nitrogen-based fertilizer imports have also tripled, from 14% to 42%.<sup>21</sup> Many of the ammonia fertilizer plants in the U.S. have shut down due to high natural gas prices, as fertilizer production moves overseas chasing the gas supply. Relying on industrial agriculture for “energy independence” masks the reality that our entire food production (and biofuel) systems are becoming increasingly reliant on foreign sources of energy, in the form of fertilizers that are increasingly being supplied from countries seen as “unstable” (because U.S. foreign policy creates instability to control energy supply).<sup>22</sup>

## Polluting BioRefineries

Ethanol production is very energy intensive, requiring mini-power plants just to produce the steam they need. Some ethanol plant proposals have sought to locate next to existing trash incinerators, coal plants or other industries capable of sharing steam with their new industrial neighbors. This may save energy, but it results in the concentrating



of polluting industries in already polluted communities. Most ethanol plants have their own power production facilities, usually burning natural gas, but many of the proposed new facilities would burn coal, due to high gas prices.<sup>23</sup> Some of the proposed ethanol plants are seeking to install gasification-style incinerators capable of burning anything from very toxic waste streams like trash, tires, plastics, construction and demolition wood waste to lesser contaminated wastes like animal, crop and food production wastes and forestry residues. All of these fuels have their own set of contaminants that would be released into the community through air pollution and the production of toxic ash. Since the facility can make more money serving as a waste disposal site by taking the more dangerous waste streams, this economic incentive could encourage these plants to become *de facto* incinerators for trash and tires.

Other parts of the biorefinery’s process also release pollution, notably a variety of toxic hazardous air pollutants and volatile organic compounds such as acetaldehyde, acetic acid, acrolein, ethanol, formaldehyde, methanol and furfural. State environmental regulations are very weak and air pollution permits fail to require that these emissions be monitored on a continuous basis (sometimes testing is required once ever, or – at best – annually).

The older ethanol plants were notorious for their excessive emissions, odor complaints, permit violations and fines.<sup>24</sup> Although the industry “solved” this problem by installing “thermal oxidizers” (incinerators) that burn off their gases, the emissions still come out, but in a chemically-altered form – one that destroys many (but not all) of the compounds, and can create new pollutants in the process.

Even after installing new equipment, neighborhood residents continue to complain of odors and ill health effects, partially because emissions still continue through “fugitive” sources (dust from grain handling, offgassing from storage tanks and unprocessed emissions via vents used to bypass pollution controls during mishaps).<sup>25</sup>

## Water Use and Pollution

For each gallon of ethanol produced, typical ethanol plants consume 3.5 to 6 gallons of water<sup>26</sup> and produce 12 gallons of sewage-like effluent in the fermentation and distillation process.<sup>27</sup> Syrup, batches of bad ethanol and sewage are dumped into streams, threatening fish and plants with chloride, copper and other wastes which deprive waters of oxygen when they decompose. A state inspector in Iowa reported that a creek by the Sioux Center ethanol plant was milky and smelled like sewage.<sup>28</sup>

## The Fuel

Ethanol evaporates faster than gasoline. So while gasoline reformulated with ethanol may release less carbon monoxide, it releases more volatile organic compounds, hydrocarbons, and nitrogen oxides. You have more vapor emissions when you're refueling and when your car is sitting in a parking lot on a hot summer day. And ethanol can degrade systems in cars, so you'll get more leaks.<sup>29</sup>

Ethanol costs three and a half times as much as gasoline to produce<sup>30</sup> and contains only 60% as much energy per gallon as gasoline.<sup>31</sup> So, while a gallon of ethanol-blended gas may cost the same as regular gasoline at the pump, it won't take you as far.

Ethanol must be blended with gasoline. But ethanol absorbs water. Gasoline doesn't. Therefore, ethanol cannot be transported by regular petroleum pipelines. Instead, it must be shipped separately and mixed on-site. Shipping by truck, rail car, or barge is far more expensive than pipelines.<sup>32</sup> They also carry larger risks of accidents during shipping. About 75% of ethanol is carried by rail.

## Fires, Spills and Explosions

Numerous fires, explosions and spills have occurred at ethanol plants and in shipping.<sup>33</sup> In October 2003, a tank holding 40,000 gallons of corn mash exploded at a Benson, MN ethanol plant, killing one worker and causing a nearby 2,000 gallon ethanol tanker truck to burst into flames.<sup>34</sup> In January 2004, an explosion caused a fierce fire at an Australian ethanol storage tank that took 14 fire crews over 20 hours to extinguish. Tail lights melted on cars parked 200 feet away.<sup>35</sup> In February 2004, a tanker carrying 3.5 million gallons of ethanol exploded and sank off of the coast of Virginia. Only six of the 27-member crew survived.<sup>36</sup> In May 2004, firefighters spent 16 hours battling a fire at an ethanol plant in Caro, MI.<sup>37</sup> In September 2005, a tanker truck spilled at least 2,000 gallons of ethanol onto the ground and into sewers in Brentwood, OH, displacing 300 residents in an evacuation and loosening up the tar on the road, required that it be repaved.<sup>38</sup> In October 2006, nearly two dozen ethanol tanker cars derailed on a bridge near homes in New



Ethanol Storage Tank Blaze, Port Kembla, Australia

Brighton, PA, spilling 485,000 gallons of ethanol in a fiery wreck that burned for days and left the park and river contaminated a year later.<sup>39</sup> In June 2007, 24 train cars derailed

in Plumas County, CA spilling 30,000 gallons of ethanol that had contained 5% benzene, causing fish kills, skin lesions in local residents, and leaving ongoing odors at the spill site 4 months later.<sup>40</sup> In October 2007, over 30 train cars containing mostly ethanol derailed, and burned for days in Painesville, OH.<sup>41</sup> In multiple cases, communities were told that just one or a few railcars contained ethanol. The true numbers didn't come out until months later.

## Magnets for Corporate Factory Farms

Among the waste by-products of ethanol production is a corn mash. The large volumes of this waste product have to go somewhere. Ethanol plant operators – to save costs – seek to use this as animal feed, regardless of whether it's nutritious and appropriate for such use. Iowa – the nation's #1 state for ethanol plants – is seeing a large influx of corporate dairy operations now. Researchers have also found ways to produce hog feed with 30-40% gluten (ethanol plant protein mash). Ethanol plants could serve as magnets for attracting factory farms.

## Net Energy: More Harm than Good?

Ethanol production using corn grain requires 29% more fossil energy than the ethanol fuel produces.<sup>42</sup> This is disputed by ethanol proponents, but the fact that there's even a debate on whether ethanol uses more energy than it creates means that it's somewhere near a 1:1 ratio, making it a pretty terrible idea to create all of the harm ethanol creates in order not to get much out of it. Using solar power to fuel electric cars is about 100 times more efficient than corn-based ethanol.<sup>43</sup>

## Billions in Subsidies

Ethanol is subsidized to the tune of \$1.10 to \$1.30/gallon, with \$67 to 82 billion dollars allocated from 2006-2012.<sup>44</sup> This money could go much further if invested in the transition to conservation, efficiency, wind and solar. The need for combustible fuels in transportation can be eliminated with the use of electric cars (and plug-in hybrids in the short term), using wind-powered electricity, at a cost less than \$1/gallon gasoline equivalent.<sup>45</sup>

Increasing the average mileage of passenger cars and SUVs by 35 miles per gallon would dwarf the effects of all possible biofuel production from all sources of biomass available in the U.S. Inflating passenger car tires properly *today* will have more impact on the energy independence of U.S. than the 2012 ethanol production requirements.<sup>46</sup>

*Footnote references available in the web version.*