Biofuels: Burning food?

On September 16, 2020, when two of the five major refiners in its region presented their plans to process biofuels instead of crude oil to the Bay Area Air Quality Management District, the District asked about fuel chain impacts associated with the new biofuel feedstock. Good question. Planned refinery biofuel projects in California could nearly triple U.S. refinery demand for oil crops and animal fats, up to as much as 70 % of total U.S. farm yield for these oils and fats, by 2023. *See* Chart 1.

Using vegetable oils and animal fats for biofuels taps land needed for food, ecosystems that support the biodiversity needed to grow food, and natural carbon sinks in healthy soils and forests.[1] It boosts food prices and increases pressure to use more land to grow crops. The price of U.S. soybean oil, a significant biofuel feedstock (*see* Chart 1), has been linked to deforestation for soybean plantations in the Brazilian Amazon and Pantanal[2–4] and for palm oil plantations in Southeast Asia.[5–7]

California refiners' current plans could take another 25–46 million acres for oil crops. *See* Chart 2.

Carbon emits from such land use changes, and from the fossil fuel hydrocarbons that refiners split for the hydrogen to refine biofuels. Land use and hydroprocessing impacts associated with some palm and soy oil biofuels drive their carbon intensity above that of petroleum fuels.[7, 8]

Less carbon-intensive "advanced" biofuels from non-food sources such as algae or cellulosic grasses have not yet proved out in practice.[9] Meanwhile, past investments in the machinery to make, deliver, and burn liquid petroleum fuels lead oil companies to retool for liquid biofuels instead of electricity-powered transportation.[10] So adding limited supplies of food crop biofuel to the petroleum we get locked into burning along with it could lead to a dead end in our path to climate stabilization.

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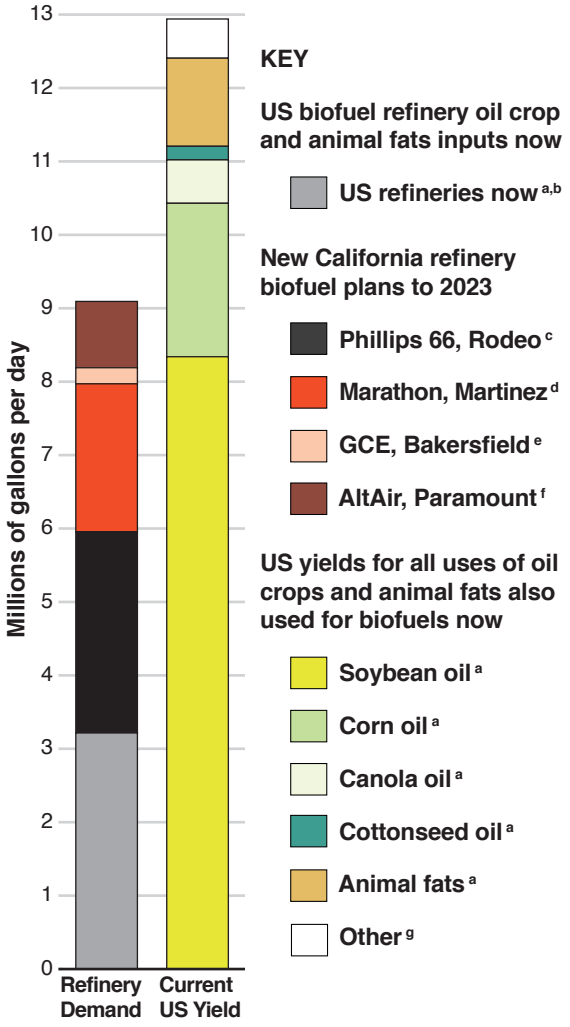

1. Oil crops and animal fats: U.S. refinery demand and California refinery plans for biofuel feedstock *v.* total U.S. yields now.

a. US refinery demand (except cottonseed, animal fats and other) and US yields (except "other") during Oct 2016–Sep 2019 from USDA; www.ers.usda.gov/data-products/oil-crops-yearbook **b.** US refinery demand for cottonseed oil in 2019, animal fats in 2018–2019 and other (oils/greases, Jul 2018–Jun 2019) from USEIA; www.eia.gov/biofuels/biodiesel/production "inputs to biodiesel production." **c.** From liquid fuel yield reported by Phillips 66 in 12 Aug 2020 email from Adrienne.Ursino@p66.com, conservatively assuming 80% of crop oil/fats feedstock converted to liquid biofuels. **d.** Marathon Petroleum Corp. project description for Contra Costa County dated Sep 10, 2020. **e.** Brelsford, R. *Oil & Gas Journal* 9 June 2020. Estimate for 80% feed conversion to 90% biodiesel liquids and 25% oil crop/animal fats input. **f.** Paramount/AltAir Renewable Fuels Project Initial Study for City of Paramount by MRS Environmental. **g.** Other (e.g., white/yellow grease) yield from Zhou et al., 2020; https://theicct.org.

Chart excludes (non-oil-refinery) oxygenate plant ethanol feedstock. Mass:volume conversions based on data for specific gravity of oils; *see* www.chemicalbook.com

Biofuels: Burning Food?

continued

Alternatives that power electric and fuel cell cars, trucks, trains, and ships with renewable electricity and hydrogen made from it by electrolysis—and use biofuels only for jets and long-haul trucks—are both feasible and necessary to achieve California's climate goals, the state's expert advice shows.[9, 11] And air pollution from burning biofuels has health costs that electric and fuel cell vehicles can avoid. Thus, other recent work shows,[12] this biofuel-light path to climate stabilization could be cheaper.

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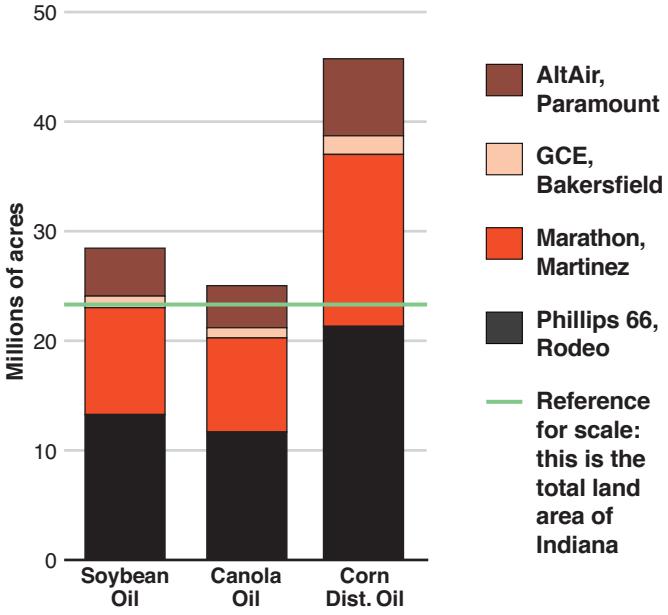

2. Acreage needed for four California refinery biofuels projects based on different feedstock crops.

Estimate based on project feedstock capacities from refiners (*see* references c–f in Chart 1) and US oil crop yields during Oct 2016–Sep 2019 in gal./acre planted (soy oil: 75.5; canola: 85.8; corn distillers oil dry mill coproduction with alcohol: 46.9) from USDA (www.ers.usda.gov/data-products/oil-crops-yearbook; www.ers.usda.gov/data-products/feed-grains-database/feed-grains-yearbook-tables.aspx; https://usda.library.cornell.edu/concern/publications/ n583xt96p?locale=en). The estimate range shown is conservative because project feedstock blends could include animal fats, which could require more acreage than vegetable oils for crop or pasture land to feed livestock.

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