

Ethanol Production Cycle

Draw arrows under each CO₂ symbol to illustrate how carbon dioxide moves in the production cycle of ethanol. Draw an up arrow if the carbon is released & a down arrow if the carbon is sequestered.

Ethanol is a **renewable fuel** because we can grow more corn to make more ethanol. Burning any fuel including ethanol releases carbon dioxide into the atmosphere, but ethanol burns cleaner - releasing 48% less greenhouse gases than gasoline. Corn plants also absorb carbon dioxide as they grow and which means the carbon cycles back to the plants and soil than just releasing more and more into the atmosphere.

CO₂



1) Plant Crop - combustion engine in the tractor burns fuel & releases CO₂

CO₂



2) Fertilize & Protect Crop - engine in the tractor or sprayer burns fuel & releases CO₂

CO₂



3) Crop Grows - plants absorb CO₂ to make food & also sequester it in the soil

CO₂



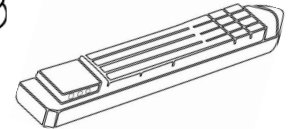
4) Harvest Crop - combustion engine in the combine burns fuel & releases CO₂

CO₂



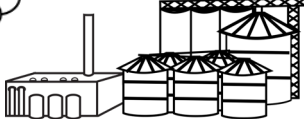
5) Stem, Leaves & Roots - decomposing plants release CO₂ to the air & sequester it in soil

CO₂



6) Transport Grain - fuel is used to move corn by truck, train or barge to a processing facility

CO₂



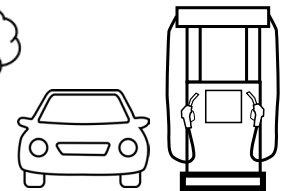
7) Refine into Ethanol - fermentation turns the sugar in corn into ethanol & releases CO₂

CO₂



8) Transport Ethanol - fuel is used to move ethanol by truck, train or barge to end users

CO₂



9) Ethanol Used - ethanol is burned as fuel in vehicles

Fuel for Thought

Choices in the production cycle can reduce the amount of CO₂ released and/or increase the amount sequestered. Write a + next to the choices that you think would reduce the carbon footprint of ethanol.

- A farmer makes fewer trips across the field during the growing season thanks to technology
- A farmer uses no till or conservation tillage practices which keep more carbon in the soil
- A farmer uses biodiesel (cleaner burning fuel from soybeans) in their tractor or combine
- Grain is transported by train or barge (more fuel efficient than truck transportation)
- At the ethanol facility, CO₂ is captured and sold to carbonate soft drinks or other industrial uses
- Drivers choose more fuel efficient vehicles
- Drivers choose to purchase higher blends of ethanol (E15 or E85) for their vehicles