

<b>Ethanol</b>	An alcohol produced through the fermentation of sugars
<b>Biodiesel</b>	A biofuel produced from animal and vegetable oils
<b>Lignin</b>	The material in plants that acts as glue and holds things together
<b>Cellulose</b>	A sugar found in plants that is used to produce ethanol
<b>Transesterification</b>	A process that converts animal and vegetable oils into biodiesel
<b>Distillation</b>	A process by which the primary product is separated from any byproducts
<b>Fermentation</b>	A process that converts sugars into alcohol through the use of enzymes

<p><b>Burns cleaner than fossil fuels</b></p>	<p>Advantage. All three generations of biofuels burn cleaner than fossil fuels. Using biofuels results in substantial reduction of unburned hydrocarbons, carbon monoxide, and particulate matter compared to emissions from fossil fuels.</p>
<p><b>Can use waste water and can be grown in the ocean</b></p>	<p>Advantage. 3<sup>rd</sup> generation biofuels are the only ones that do not require clean, fresh water to grow the biomass</p>
<p><b>Technology still needs improvement to make it competitive with fossil fuels</b></p>	<p>Disadvantage. 2<sup>nd</sup> and 3<sup>rd</sup> generation biofuels still need technological improvements. 2<sup>nd</sup> generation to break down the lignin easier and cheaper and 3<sup>rd</sup> generation to improve the extraction process and drive down operating costs.</p>
<p><b>Biomass source are food crops such as corn, potatoes and sugar beet</b></p>	<p>Disadvantage. 1<sup>st</sup> generation biofuels are the only ones that use food crops as biomass. This might make food prices lower and ethical questions of what is a better use for these crops.</p>
<p><b>Produces ethanol, which has a much lower energy density than gasoline</b></p>	<p>Disadvantage. All three generations of biofuels are capable to produce ethanol but it is mainly done with 1<sup>st</sup> and 2<sup>nd</sup> generation biofuels. 3<sup>rd</sup> generation biofuels produce mainly biodiesel which also has a lower energy density than petrodiesel, its fossil fuel equivalent.</p>
<p><b>Competes with food crops over clean water and arable land</b></p>	<p>Disadvantage. 1<sup>st</sup> and 2<sup>nd</sup> generation biofuels compete with food crops over clean water and arable land.</p>

<p><b>Biomass crops can be grown in land unsuitable for food crops</b></p>	<p>Advantage. 2<sup>nd</sup> generation biomass can be grown in areas of the world where crops do not grow. 3<sup>rd</sup> generation biofuels can be grown in ocean or in waste water that is unsuitable for food crop use.</p>
<p><b>Is more energy dense per acre of harvest than the other two generations</b></p>	<p>Advantage. 3<sup>rd</sup> generation biofuels can produce more biofuel per acre harvested than the other two generations.</p>
<p><b>Needs to be treated prior to fermentation to release the 'trapped' sugars</b></p>	<p>Disadvantage. 2<sup>nd</sup> generation biofuels require that lignin be broken up to release the cellulose and hemicelluloses trapped within it and are fermented to produce fuel. This process requires energy, materials and time therefore it makes it financially disadvantageous over fossil fuels and 1<sup>st</sup> generation biofuels.</p>
<p><b>Provides only a slight advantage with regards to greenhouse gases due to the high energy input required to produce</b></p>	<p>Disadvantage. 1<sup>st</sup> and 2<sup>nd</sup> generation biofuels require a high amount of fossil fuels to fuel the production process.</p>
<p><b>The process to produce has been known for centuries and is used to make alcohol, yogurt, vinegar, etc</b></p>	<p>Advantage. 1<sup>st</sup> and 2<sup>nd</sup> generation biofuels use fermentation to convert sugars into ethanol. This process has been used to make products such as alcohol, vinegar and yogurt.</p>

