

EDUCATION AND OUTREACH

Bioenergy 101 Common Vocabulary

These are terms you will hear frequently in discussions of biofuels. Definitions are tailored towards discussions of the production of cellulosic ethanol and many terms have broader uses in other fields.

Assay	a test to determine presence and/or amount of a substance in a sample
Biodiesel	a fuel made from plant oils and fats, rather than cellulose or other carbohydrates (which are used to make ethanol). This can be used in cars that run on regular diesel fuel, but not gasoline.
Cell Wall	shapes plant cells and provides structural support and disease protection to plants
Cellular Respiration	a series of chemical reactions that occur in cells to capture energy from food and turn it into a form cells can use (ATP) and other byproducts. See fermentation.
Cellulase	an enzyme that breaks cellulose into glucose
Cellulose	The most abundant plant material. A carbohydrate, made of a chain of (beta) glucose rings strung together. A major component of the cell wall.
Corn Stover	All of the parts of corn plant (stalk, leaves, cob, etc.) excluding the grain (kernels).
Enzyme	a protein molecule that functions as a catalyst, i.e. it helps break apart (or build) other molecules. Enzyme names always end in "ase." So cellulase, an enzyme, breaks apart cellulose, a carbohydrate.
Ethanol	an alcohol that can be produced by fermentation of plant material. The same alcohol found in beer, wine and spirits. Denatured ethanol is used for transportation—it is drinkable ethanol that has additives to make it undrinkable.
Feedstock	the plants or waste products (corn grain, corn stover, switchgrass, sugar cane, wood chips, etc) used to create biofuels such as ethanol, or other industrial chemicals.
Fermentation	a form of cellular respiration done in an environment without oxygen. Yeast and bacteria are frequently used as fermenters; they consume sugars for energy and release byproducts such as ethanol and carbon dioxide.
Gasification or Fischer-Tropsch Synthesis	a chemical process using a great deal of energy and pressure to turn biomass directly into fuels without biological fermentation. The product is sometimes called syn-gas.
Genome	The complete DNA sequence associated with a particular species.
Genotype	the letter code combination for a gene (Tt vs TT)

Common Vocabulary Continued

Glucose	a simple sugar or carbohydrate. Cellulose and starch are both broken down into glucose before fermentation into ethanol.
Hemicellulose	a component of the cell wall, a carbohydrate, with a more branched structure than cellulose.
Hydrolysis	process in reaction with water of breaking larger molecules into smaller ones, for example breaking cellulose into glucose.
Lignin	A component of the cell wall. Not a carbohydrate. The intricate association of lignin and cellulose presents one of the major challenges in converting cellulose into ethanol.
Ligno-cellulose	a combination of lignin and cellulose. This is the most complete way to speak about using the whole plant as a feedstock for biofuels.
Phenotype	the physical appearance as a result of the gene (tall vs short)

Commonly discussed organisms:

<i>Arabidopsis</i>	a member of mustard family, commonly studied as a model organism in plants because it is very small, has a small genome and has a short life-cycle.
<i>E. coli</i> or <i>Escherichia coli</i>	bacteria studied for ethanol production, different strains of <i>E. coli</i> are discussed in the news as sources of food poisoning, everyone normally has helpful <i>E. coli</i> in their gut
<i>Miscanthus</i>	a tall grass, native to Asia, being researched for ethanol feedstock
<i>Rhodobacter sphaeroides</i>	bacteria studied for hydrogen fuel cells
<i>Saccharomyces cerevisiae</i>	yeast commonly used for fermentation, and the making of bread and alcoholic beverages.
Switchgrass	a native grass in Wisconsin—could be grown in dense prairie-like stands for ethanol feedstock