

## THE SIGNIFICANCE BIOREFINERY AND LIGNOCELLULOSIC BIOMASS

In recent years, ethanol as a substitute to gasoline in transportation sector has received an increased attention because it holds unique properties regarding economical and particularly, environmental issues.

Utilization of lignocellulosic biomass introduces advantages over the food based sources since they are available in abundant amounts and have low cost.

LB such as energy crops like switchgrass, wood wastes, paper wastes and agricultural residues can be converted to fermentable sugars for ethanol production and this product is called cellulosic ethanol. Unlike food based sources, conversion of LB to fermentable sugars and then to ethanol is not an easy job.

Lignocellulosic biomass is an important renewable source for the production of second-generation biofuels. Many lignocellulosic biomasses like rice straw, sugarcane bagasse, wheat straw, cotton stalk, switchgrass, bamboo, sugarcane tops, paper wastes are some of the abundantly available wastes.

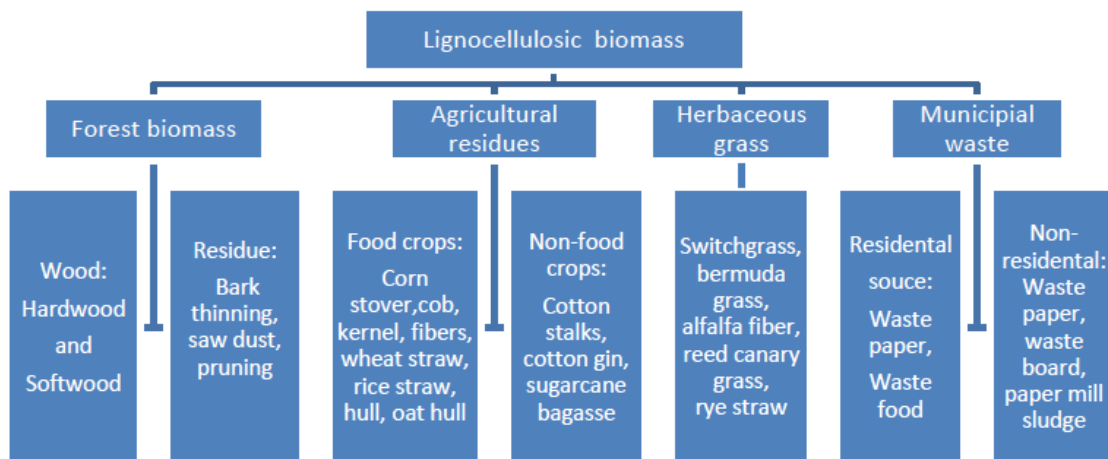
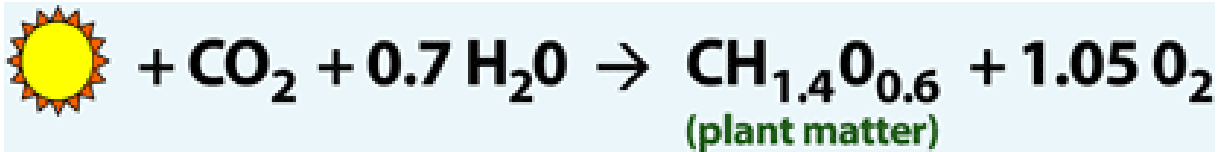


<https://uwm.edu/news/engineering-switchgrass-for-better-biofuel/>

<https://www.washington.edu/news/2015/09/04/poplar-trees-are-best-bet-for-biofuel-in-uw-led-research-project/>

<https://www.junkclear.co.uk/waste-paper-cardboard-recycling>

Photosynthesis - Utilization of CO<sub>2</sub> and sunlight for the generation of plant matter



Lignocellulosic biomass is as an abundant, cheap, renewable naturally occurring raw material.

An attractive starting point that offers promising platforms for the production of biofuels and biochemicals.

Utilization of lignocellulosic biomass brings in the following main advantages:

1-Lignocellulosic biomass consumes CO<sub>2</sub> that is released by the combustion of fuels ----- net CO<sub>2</sub> emissions reduce

2-Lignocellulosic biomass abundant, cheap and naturally occurring raw material.

3- Many forms of renewable energy are suited only to electricity production and are, therefore, difficult to utilize to fuel vehicles. Biomass is uniquely suited among renewable energy sources for conversion to transportation fuel.

4- Biomass is unique as the energy it contains is stored as chemical bonds, and indeed biomass is the only renewable source of carbon atoms.

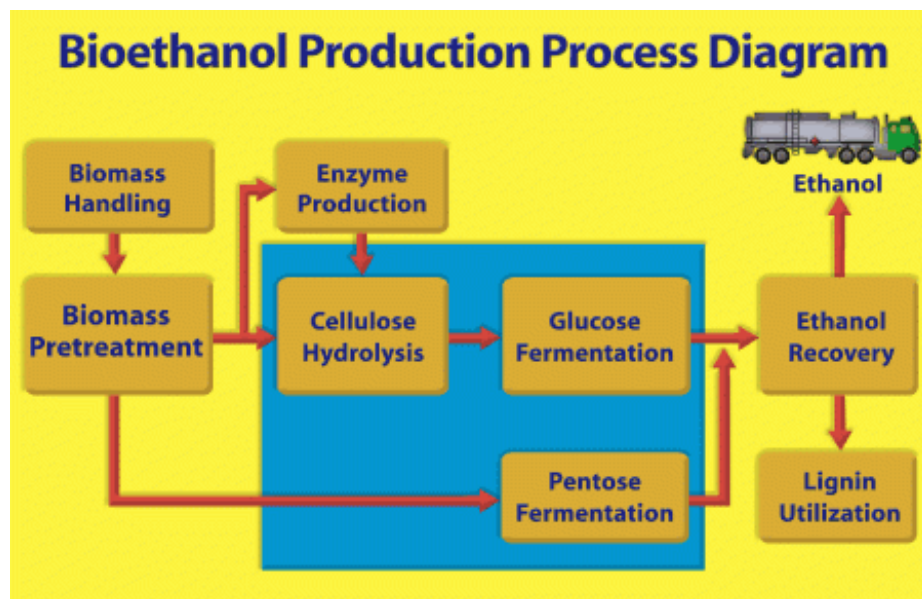
Q:Can edible biomass be used for biofuels production?

A: Yes, it could be but poverty, finite area for plantation and increase in food prices strengthen the interest in cellulosic ethanol production.

Conversion of biomass into biofuels and biochemical is split into two categories: biological routes and thermochemical routes.

Conversion of lignocellulosic biomass into ethanol through **biological routes**

- 1-pretreatment – biomass deconstruction, biomass fractionation,
- 2-enzymatic hydrolysis – hydrolysis of carbohydrates into glucose and other sugars,
- 3-fermentation – sugar consumption by yeasts to convert fermentable sugars into ethanol.
- 4-ethanol recovery – ethanol distillation, separation of ethanol from the medium



<http://www.greenandpractical.com/Bioethanol%20production%20process%20info.html>