Anaerobic Digestion Benefits

Benefits of Anaerobic Digestion

- Energy Production
- Nutrient Recovery
- Combat Global Warming
- Pathogen Reduction

- Conserve Energy
- Conserve Land
- Reduce Odors
- Manage Waste
- Save the Earth!

Global Warming and Biogas

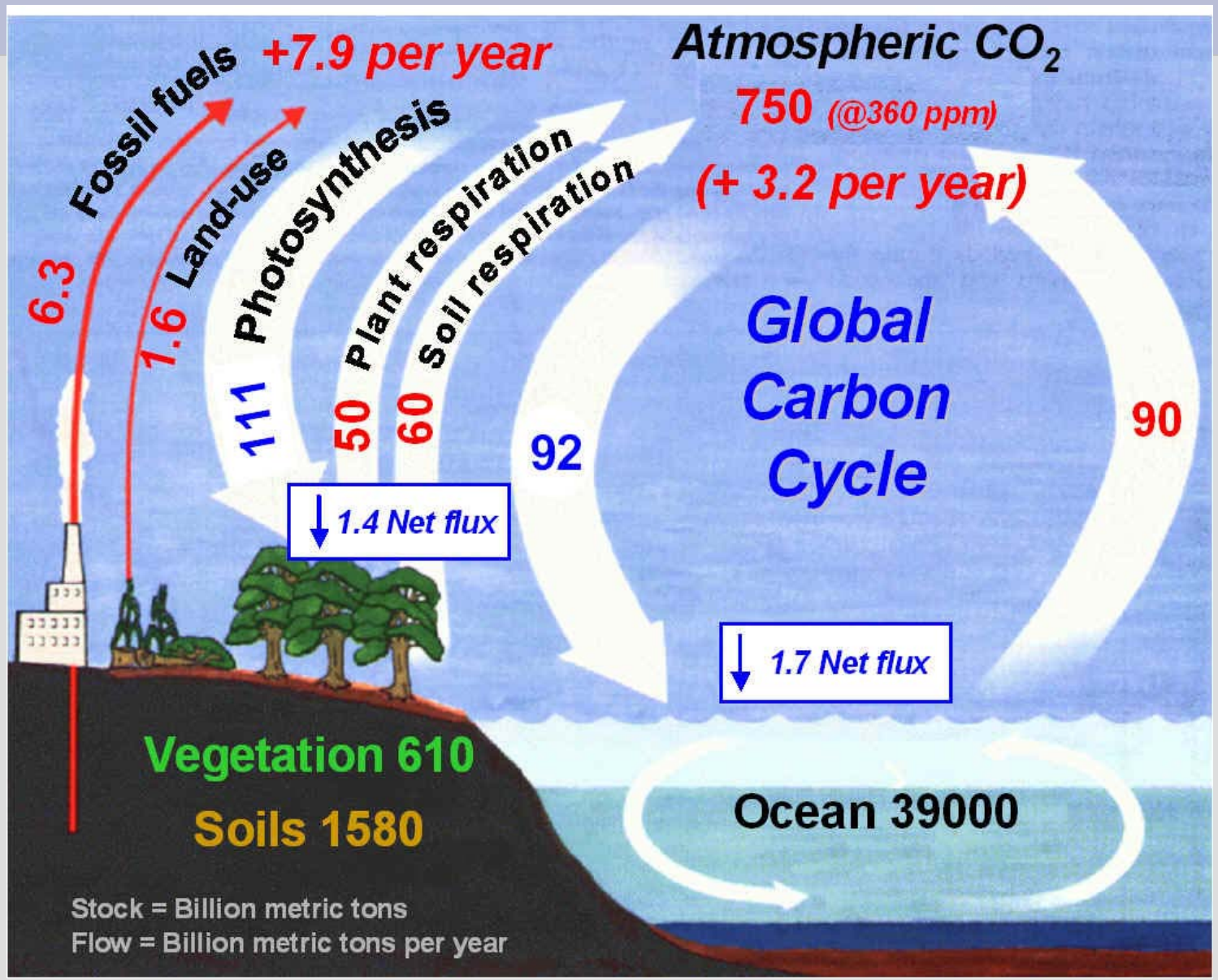
- As greenhouse gases fill our atmosphere our climate is beginning to change
- Greenhouse gases such as CO2, CH4, and other gases are causing a global climate change crisis
- Methane is 21 times more powerful than CO2 over a 100 year life cycle
- Destruction of methane is a commodity

Biogas and Global Warming

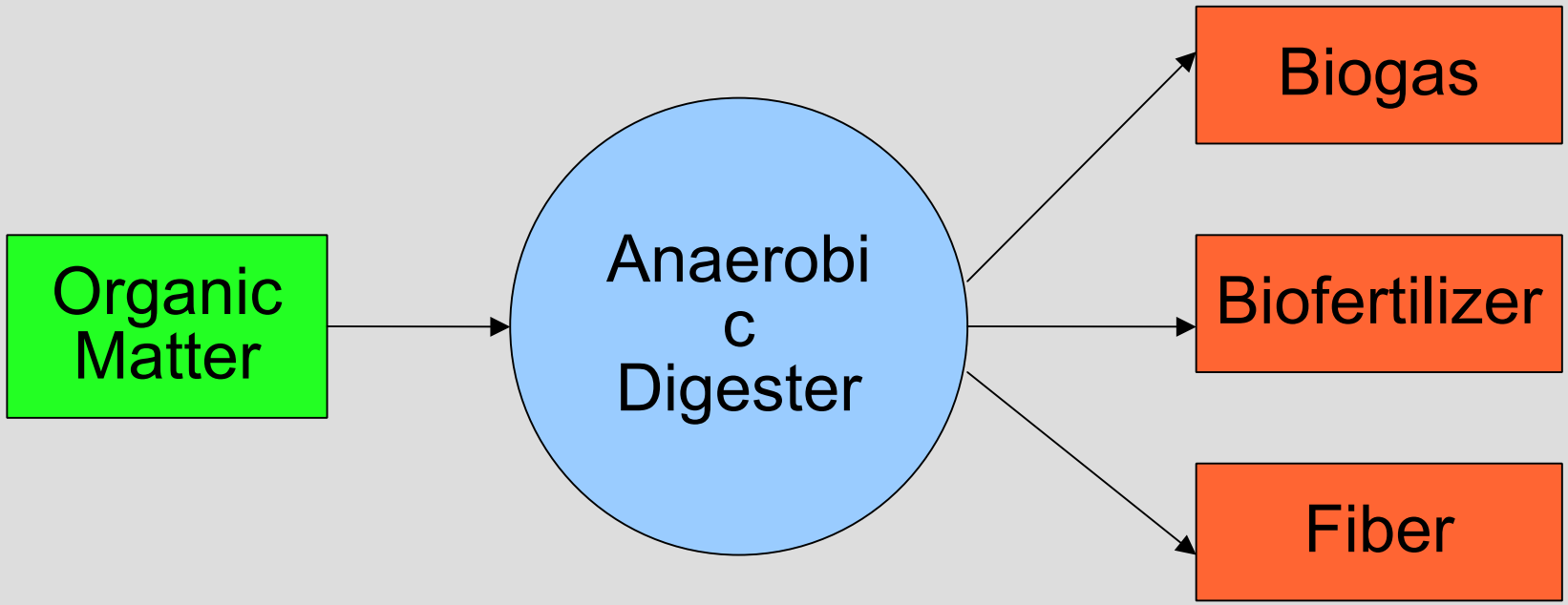
- Carbon neutral energy source
- Anaerobically digested effluent builds top soil an important carbon sink
- Fertilizer grows plant material another important carbon sink

Plants fix Atmospheric Carbon Dioxide

Carbon Budget

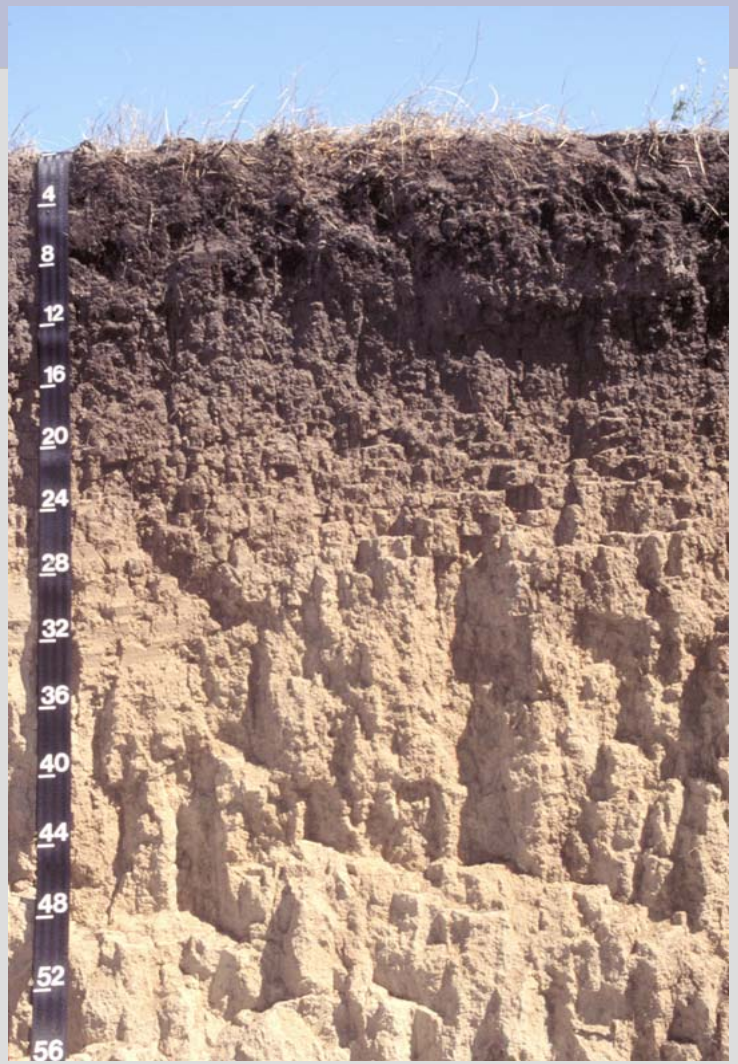


Anaerobic Digestion



Biofertilizer

- Topsoil is supplemented with fertilizer to grow crops
- Phosphorous mining is one of the most environmentally harmful practices in FL
- Nitrogen fixed with the Haber-Bosch process consumes 1% of the world's energy supply



Soil Profile

http://www.sciencemag.org/cgi/content/full/297/5587/1654

Biofertilizer

Digester Effluent in the Developing World

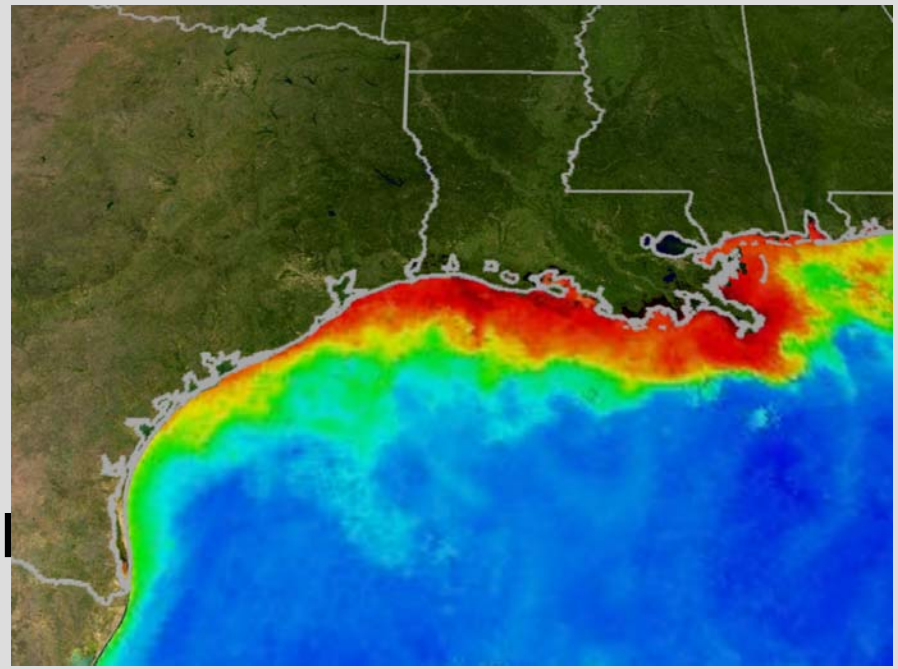
- Anaerobic Digestion removes Carbon in feedstock leaving a valuable, nutrient rich effluent
- Nutrients are mineralized to a soluble, bioavailable form

Eutrophication

- Nutrient overloading can cause ecological collapse by creating aquatic areas with little or no oxygen, dead zones
- Nutrients cause an algal bloom which leads to a die off
- Agriculture and urban runoff containing chemical fertilizers are largely responsible

Biofertilizer

- Eutrophication by nutrients is a major environmental problem
- Effluent contains fiber to mitigating erosion and aiding nutrient manageme
- Anaerobic Digestion builds soil up through the natural soil building process



Eutrophication in the Gulf of Mexico

Anaerobic Digestion and Energy

Aeration Plant

- Avoids energy from costly aeration
- Avoids resource costs from producing energy intensive fertilizers
- Decentralized, avoided transportation costs

Biogas

- Flared off
- Direct Combustion
- Electricity production
- Compressed Natural Gas Vehicles
- Fuel cell

Honda's CNG Vehicle

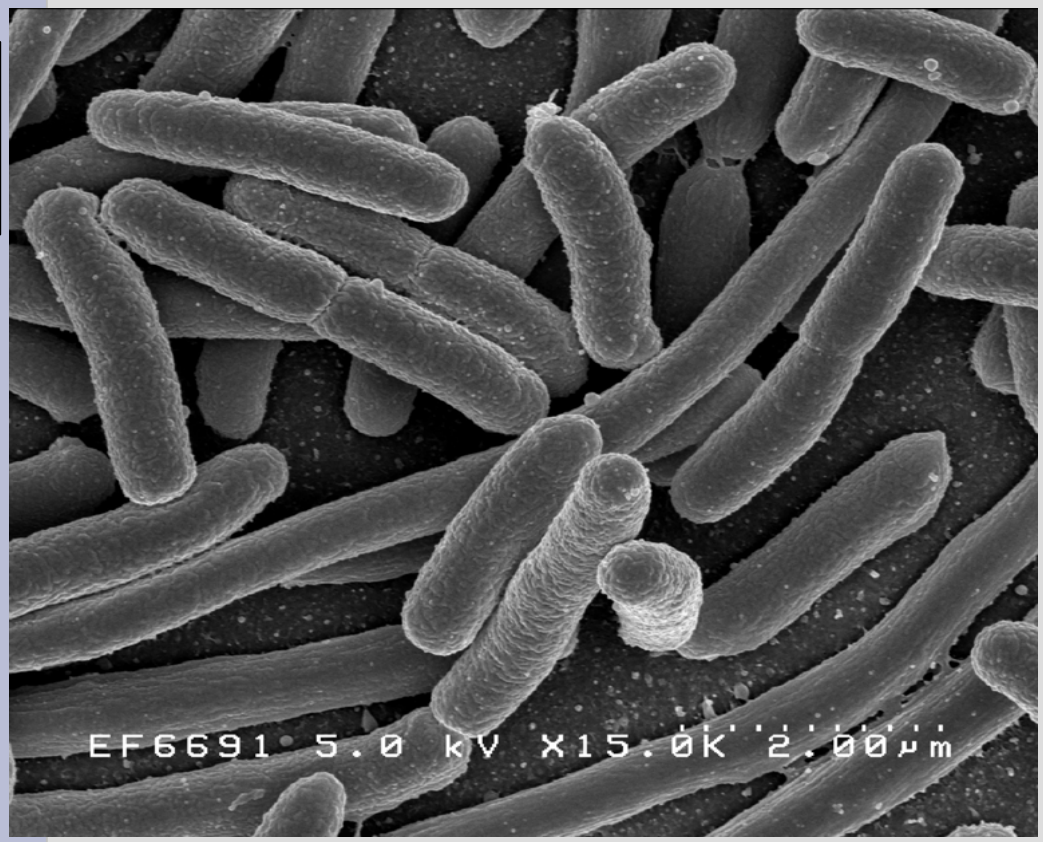
Biogas Fueled?

Combustion

Gas Flare

- Water heaters
- Steam generation
- Electricity production from Internal Combustion, microturbine

Pathogen Reduction



E. Coli

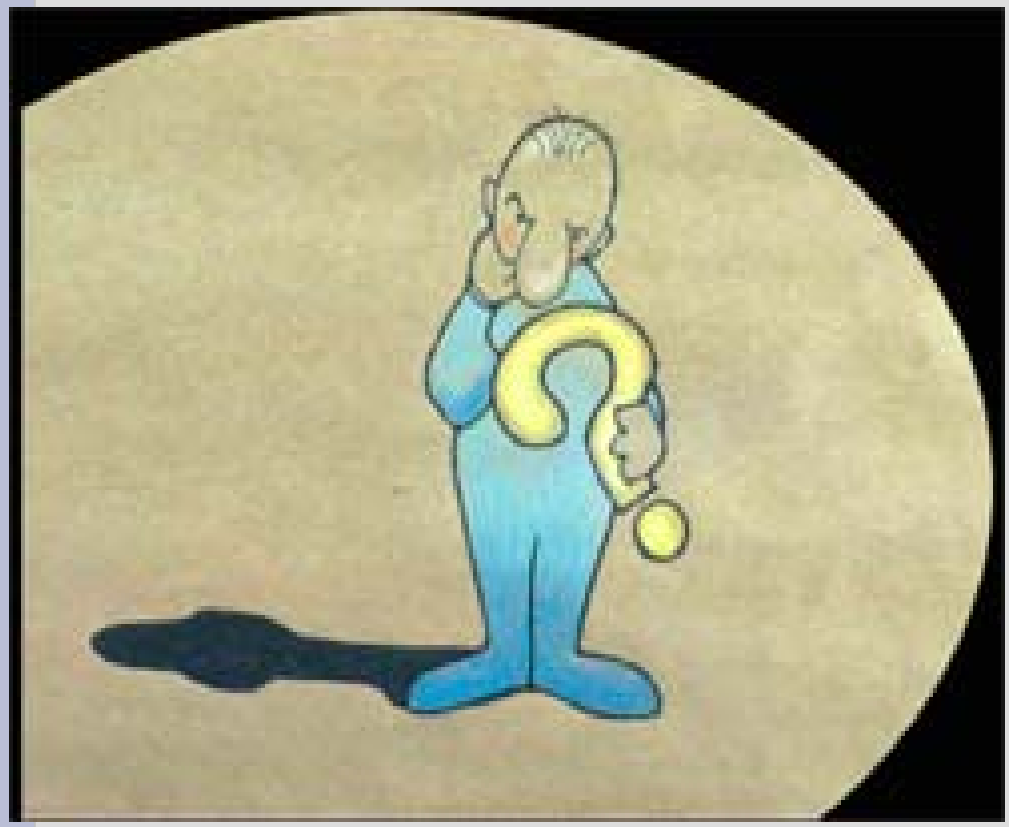
- The anaerobic microbial community can select for non-pathogenic microbes
- Studies have shown that anaerobic digestion of manure wastes is an effective way of reducing pathogens

Land Conservation

- Small Facility Print
- Prevents waste from going into Landfills
- Removes need for large Aeration plants

UF/IFAS Anaerobic Digester

Landfill Gas vs Biogas



- Similar process occurs in a landfill
- Issues: Biogas quality, Nutrient recovery, Land use, Methane potential
- Anaerobic Digestion in vessel provides many additional benefits over Landfills

Questions?