The Power of Biofuels

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Green Team
Biofuel Background

- Fuels made from living things or their waste
- Common modern fuel is ethanol
- A possible replacement for liquid transportation fuels
- Controversial due to the energy required to produce and use of food crops in production
Types of Biofuels

- **Corn ethanol** - liquid form of biomass
  - fermentation - sugars are converted to ethyl alcohol; used to create energy

- **Cellulosic ethanol** - produced by turning cellulose sugars into alcohol fuel
  - Cellulosic ethanol production estimated 75 billion gallons/year by 2030

- **Biodiesel** - Domestically produced from non-petroleum, renewable resources
  - Can be used in most diesel engines
  - Less greenhouse gas emissions
  - Biodegradable, non-toxic, and safer to handle
Experiment - Making Biofuel

- Goal: create fuel with zero waste
- Mix vegetable oil and ethanol to make biodiesel
- Add NaOH as a catalyst
  - catalyst is not a reactant but makes reaction happen more efficiently
Experiment - Making Biofuel

- Allow transesterification reaction to take place
  - Transesterification - process of breaking down fats in the presence of ethanol

- Products are glycerin and biodiesel
  - Glycerin is used for various things like lotion, soap, and keeping cookies moist.
Experiment - Energy Density

- Tested energy density with calorimetry
- Energy density - amount of energy stored in a system per volume
- Calorimetry - the art of measuring heat
Policy

- Biofuel Standards
  - NO\textsubscript{x} emissions higher than oil based fuels
- Energy Policy Act of 2005
  - Tax Incentives
    - $1/gal tax credit on biodiesel
  - Increased ethanol in standard gas
- Bioenergy Technologies Office
- Carbon Tax
  - Proposed tax on fossil fuels entering economy
    - Carbon neutral
Impact

• Environmental
  o Carbon neutral

• Social
  o Food vs. Fuel
  o Rural life
Biofuels

Advantages:
- Renewable
- Reduce greenhouse gases
- Economic security
- Reduce dependence on foreign oil
- Lower levels of pollution
- A possible “drop-in fuel”

Disadvantages:
- High costs of production
- Monoculture
- Use of fertilizers, potentially harming the environment
- Shortage of food
- Industrial pollution
- Large amount of water use
- Biomass to biofuel-20% efficient
Conclusion

- The technology of biofuels is still advancing
  - Synthetic photosynthesis
  - Use of algae to produce biofuel

- The world needs a renewable source of liquid fuel to maintain our current modes of transportation

**Is biofuel the way? You decide.**


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Questions?