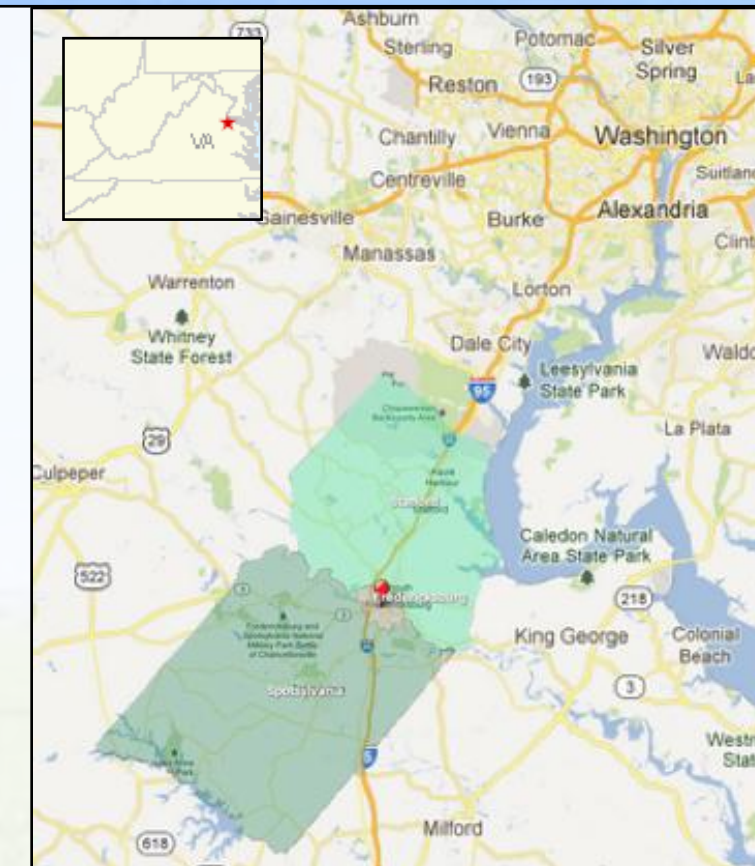


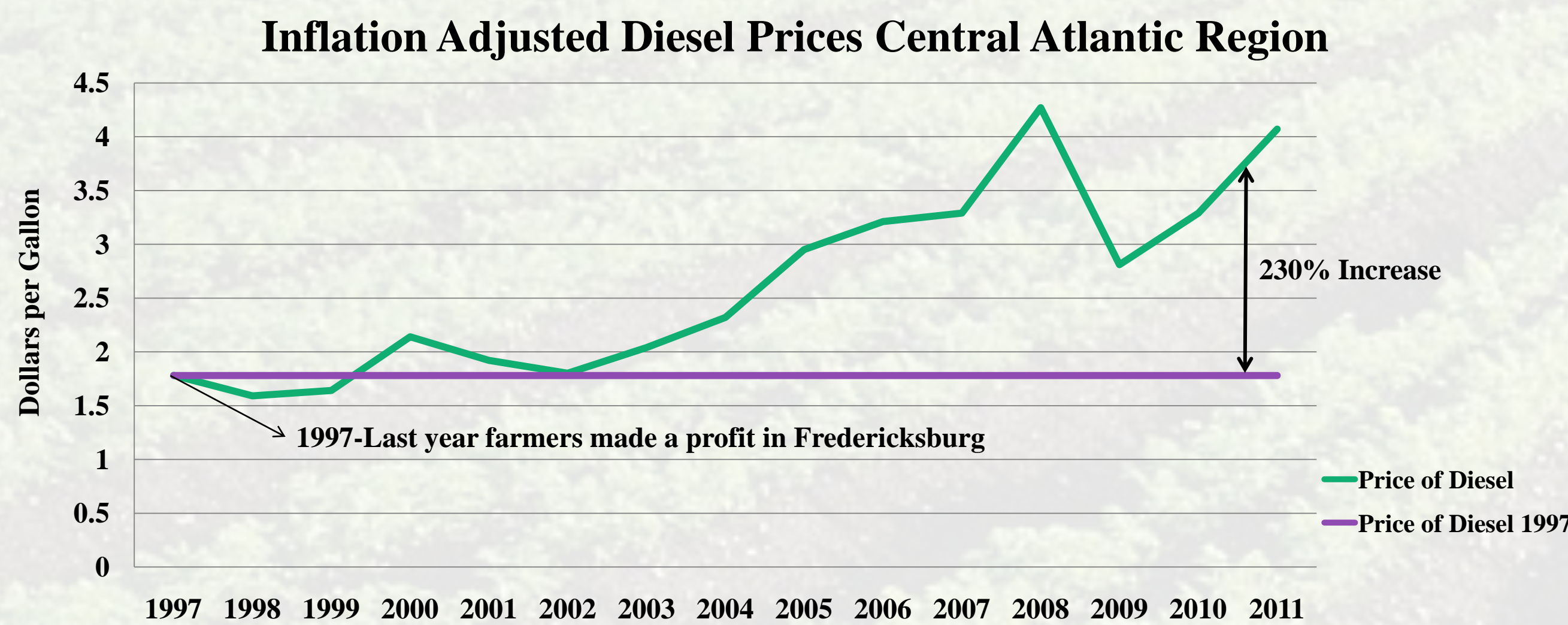
Context

Farms in the Fredericksburg, Virginia:

	1997	2007
Production Expenses	\$23,990	\$63,500
Income from Operations	\$763	-\$7,320
Diesel Price	\$1.74	\$3.22



❖ Diesel price has increased by nearly **230%** since 1997 causing production expenses to rise as the cost of oil price dependent categories increases.



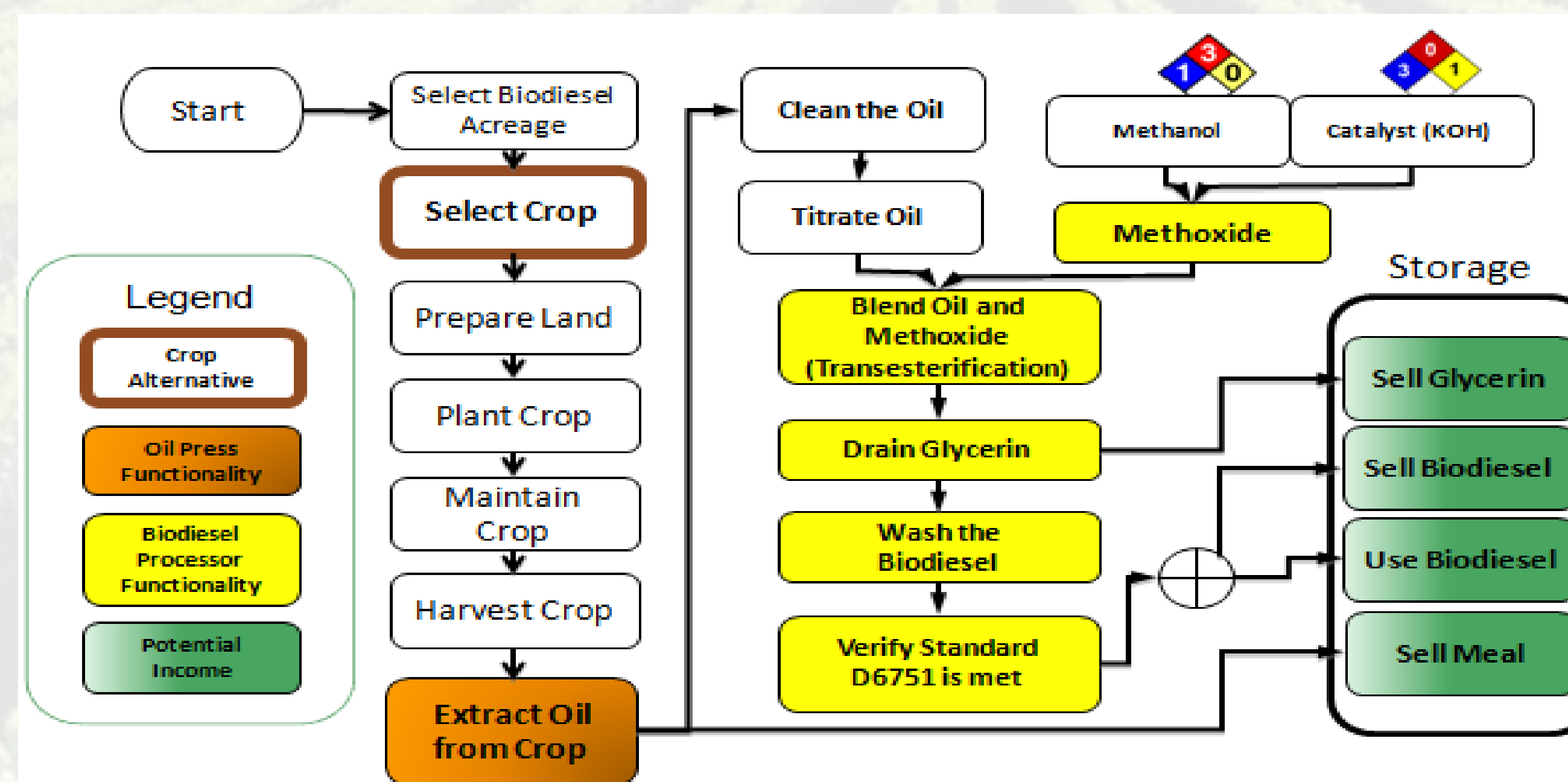
Problem and Biodiesel Process

Problem:

- ❖ Increasing fuel prices and lack of net profit threaten the long term sustainability of farms located in Fredericksburg, VA.

Biodiesel is a biofuel made from living or recently living organisms such as vegetable oils, animal fats, or algae.

Biodiesel Production Process:



Design Alternatives

Biodiesel Production System Components:

- (1) Crop Type
- (2) Vegetable oil press
- (3) Biodiesel processor
- (4) Biodiesel storage tank



- ❖ **Focusing on crop type** enables optimization of crop acreage and biodiesel output.

- ❖ **Crop alternatives selected based on availability, cost, and productivity:**

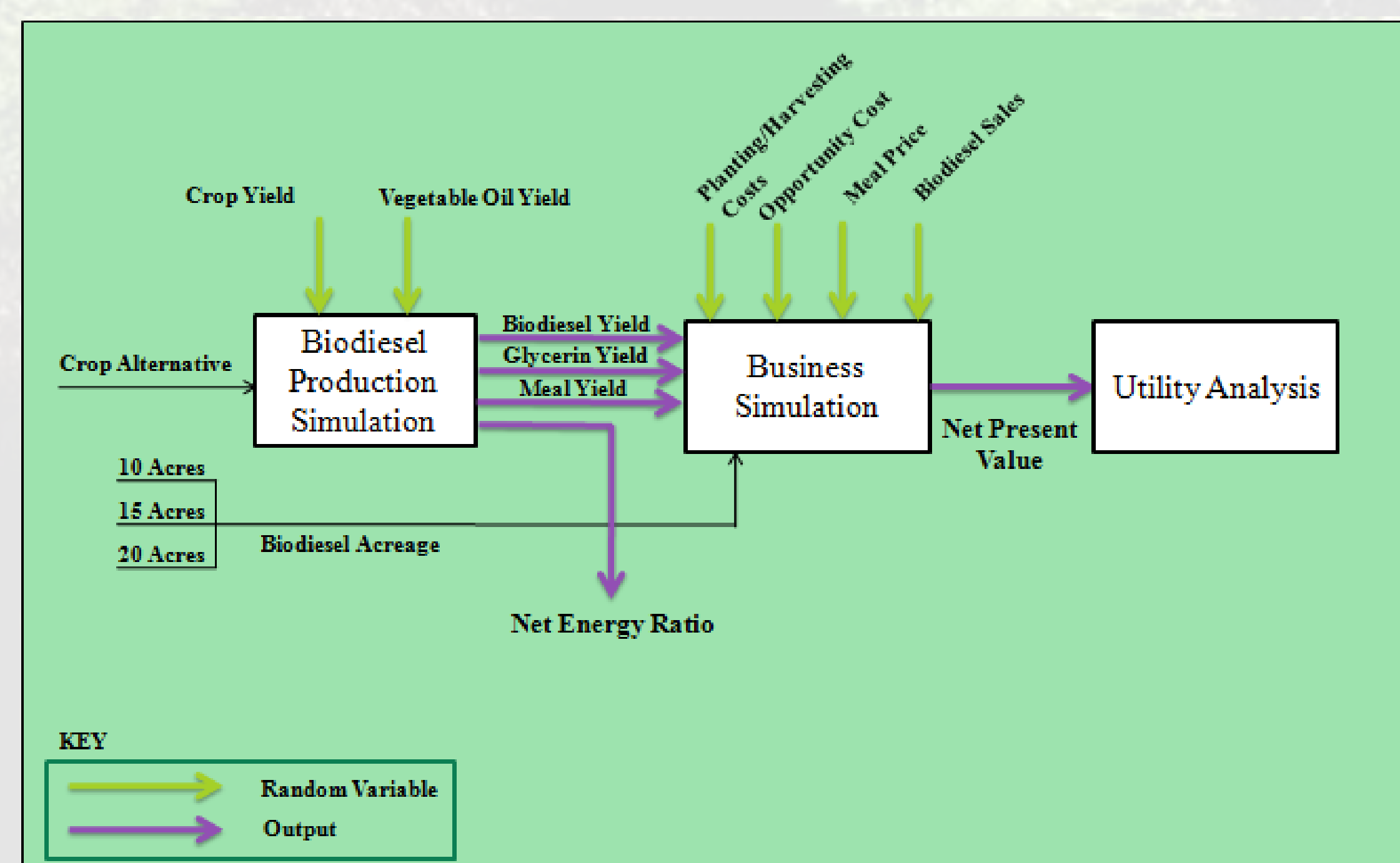
- (1) Corn
- (2) Canola
- (3) Peanut
- (4) Soybean
- (5) Sunflower

- ❖ **Optimal crop type will be determined through Monte Carlo simulation**

Method of Analysis

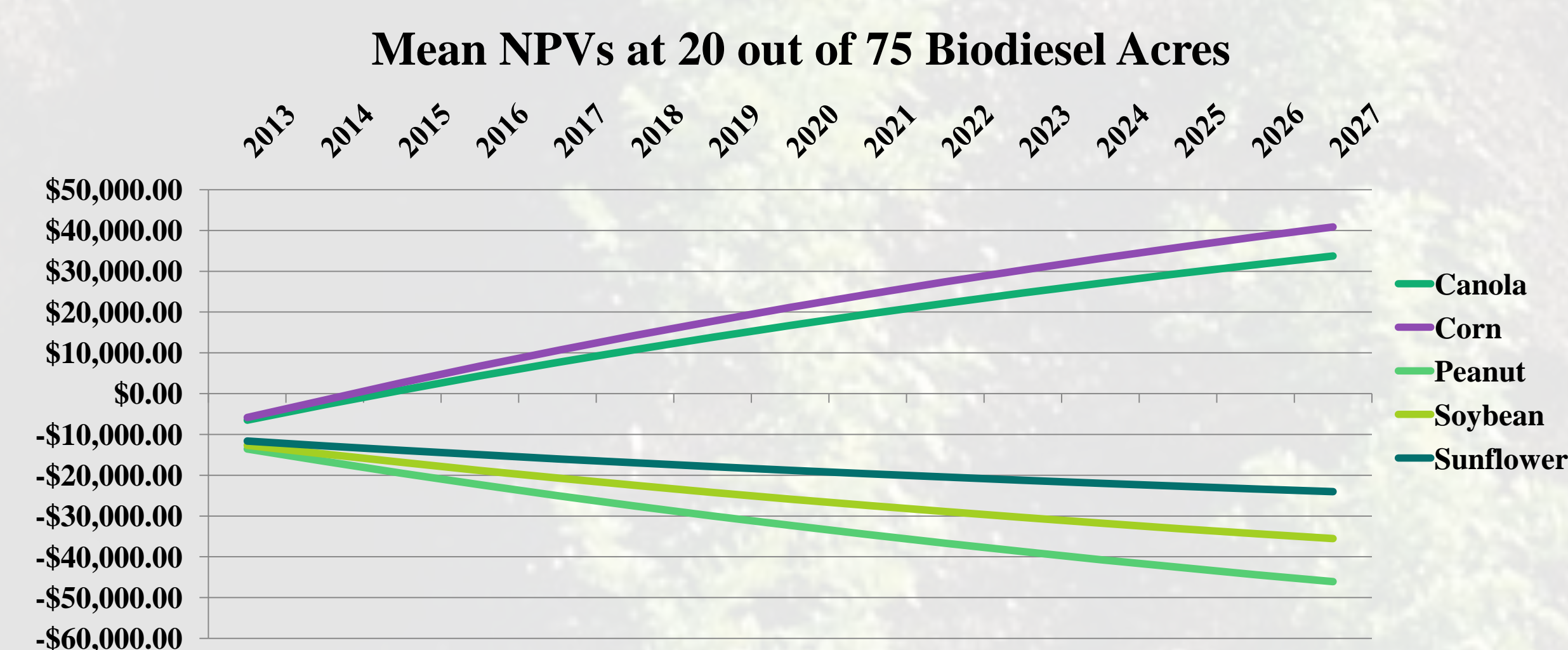
Monte Carlo Simulation Objective:

- 1) **Biodiesel Production Simulation:** Determines biodiesel yield and Net Energy Ratio of each crop alternative
- 1) **Business Simulation:** Determines the Net Present Value of each crop alternative



Results

Crop	Biodiesel Yield	Net Energy Ratio	NPV 10 Acres	NPV 15 Acres	NPV 20 Acres
Peanut	136 gal/acre	4.09	-\$46,400	-\$46,200	-\$46,100
Canola	102 gal/acre	3.43	-\$6,600	\$13,600	\$33,700
Sunflower	62 gal/acre	3.05	-\$29,900	-\$29,700	-\$24,000
Soybean	35 gal/acre	1.77	-\$25,000	-\$31,400	-\$35,600
Corn	19 gal/acre	0.84	\$14,400	\$27,600	\$40,500



- ❖ Corn and Canola reach a positive return on investment within 2 years

Recommendations

- ❖ It is recommended that farmers in Fredericksburg, VA implement biodiesel production using **Canola**.
- ❖ **High biodiesel yield** minimizes food supply impact
- ❖ **High NPV** provides profit for farmer
- ❖ When 20 acres are committed to biodiesel production, **Canola** has a **99%** chance of being profitable

