

## Some Facts

- Roadways  $\approx$  4 million miles
  - If 25% of area is used = 10 million acres
- Railroads  $\approx$  140,000 miles of rights of way
  - If 75% of area is used = 1 million acres
- Airports  $\approx$  19,820
  - If 100 acres/ airport = 2 million acres
- Military  $\approx$  Department of Defense owns 30 million acres of arable land in the United States
  - If 30% of areas are used 8 million acres

## Project Objectives

- Investigate Agronomic Conditions
- Investigate Environmental Impacts
- Investigate Economic Viability
- Investigate Crop Selection

## Potential Benefits/Advantages

- This method of fuel production:
  - Benefits of biodiesel
  - Increases aesthetics
  - Decreases costs of maintenance
  - Aids in educating the public about renewable fuels
  - Does not affect food supply
- *“We need food and we need fuel, but those shouldn’t conflict”* Jeff Steiner USDA ARS

## Considerations

- Safety
- Structural Integrity
- Establishment and Harvesting
- Economics
- Wildlife Impacts
- Ecology/Environmental Impacts
- Water Quality
- Grower Concerns

## Roadside Biodiesel Production Potential (ARID)

- UDOT Lands could potentially produce over 250 gallons/mile of Biodiesel
  - Assumptions:
    - 100 Foot Wide Growing Region per Mile(12 acres)
    - 60% Dry Land Yields
  - This solves maintenance and pest cost problems
    - \$300/mile for 2007

## DOT Vehicles and F2F biodiesel



# Economics' of Freeways to Fuel

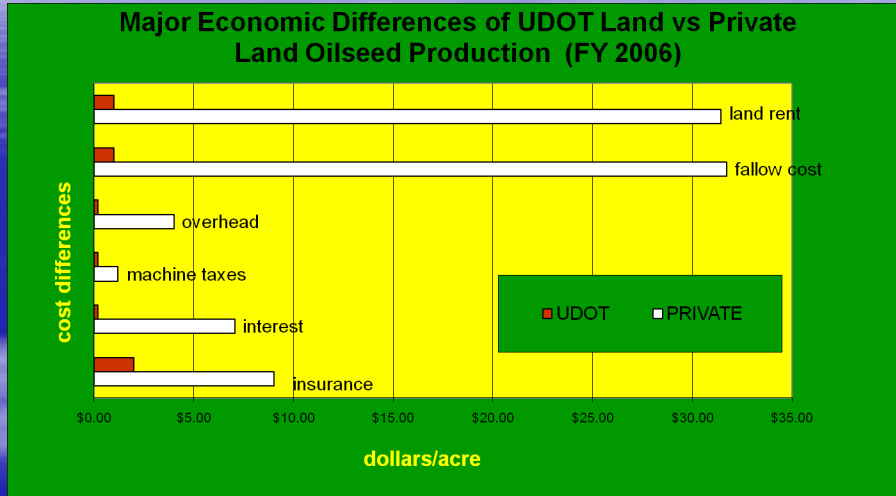
Economic Model - State Grown Freeway Biodiesel (Fall Canola) May 2008

\*baseline values compared to 2006 Eastern Washington Estimates by Kathleen Painter and Dennis Roe:  
[http://cif.wsu.edu/Publications/budgets/dry/land%20winter%20canola%20budget\\_14inch.xls](http://cif.wsu.edu/Publications/budgets/dry/land%20winter%20canola%20budget_14inch.xls)

			units	cost/unit	total	
replace diesel fuel at	\$3.00	<b>Operating Costs</b>				
width of growing area(ft)	100.0	Aerator/Spreader/Seeder \$2/ acre	1	\$2.00	\$2.00	
acres of growing area/mile	12.1	Canola Seed	10	\$2.00	\$20.00	*adjusted to untreated prices
yield per mile cwt	78.8	Nitrogen lbs/acre ((NH4)2SO4	40	\$0.70	\$28.00	
gallons of oil/mile	371.0	P2O5 lbs/acre	0	\$0.30	\$0.00	
cost biodiesel production/mile	\$1,104.59	Sulfur lbs/acre	10	\$0.20	\$2.00	
worth of biodiesel/mile	\$1,113.14	Herbicide - glyphosate	2	\$5.00	\$10.00	*adjusted to generic prices
Profit/mile	\$8.55	Insecticides	0.4	\$7.00	\$2.80	*adjusted to generic prices
Total Savings/mile	\$318.55	Fuel - Diesel/Gasoline	2	\$3.20	\$6.40	
		Machinery Repair	1	\$5.98	\$5.98	
processing costs/acre	\$28.47	Labor (machine)	1	\$12.00	\$12.48	*this may be modified down
gallons of oil (per acre)	30.6	Labor (non-machine) hrs	0.3	\$12.00	\$3.00	
cake for cattle feed	\$39.00	Interest on Capital @ 5.50%	0	\$2.50	\$0.00	
production of biodiesel/acre	\$91.13	<b>Total Operating Costs/Acre</b>			<b>\$92.66</b>	
<b>assumptions:</b>		<b>Fixed Costs</b>				
yield cwt/acre*	6.5	General Overhead		\$2.00	\$2.00	
cost of maint/mile	\$310.00	Machinery Depreciation		\$6.00	\$6.00	*adjusted to lower machinery costs ~ airway
pressing per gal	\$0.13	Machinery Interest		\$0.00	\$0.00	*all equipment leased
processing costs (gallon)	\$0.80	Land Rent		\$0.00	\$0.00	*state owned
fuel tax credit	\$0.00	Management Fee		\$1.00	\$1.00	
weight of oil per gal	7.4	Fallow Cost		\$0.00	\$0.00	*state owned - no rent due
oil yield (%)	41.0%	Property Taxes		\$0.00	\$0.00	*state owned
extraction efficiency (%)	85.0%	Insurance		\$0.00	\$0.00	*state owned
value of cake /ton	\$200.00	<b>Total Cash Ownership Costs/Acre</b>			<b>\$9.00</b>	
		<b>Total Cost/Acre</b>			<b>\$101.66</b>	
*lower than average yields						

# Brief View of Economics' of F2F

Major Economic Differences of UDOT Land vs Private Land Oilseed Production (FY 2006)

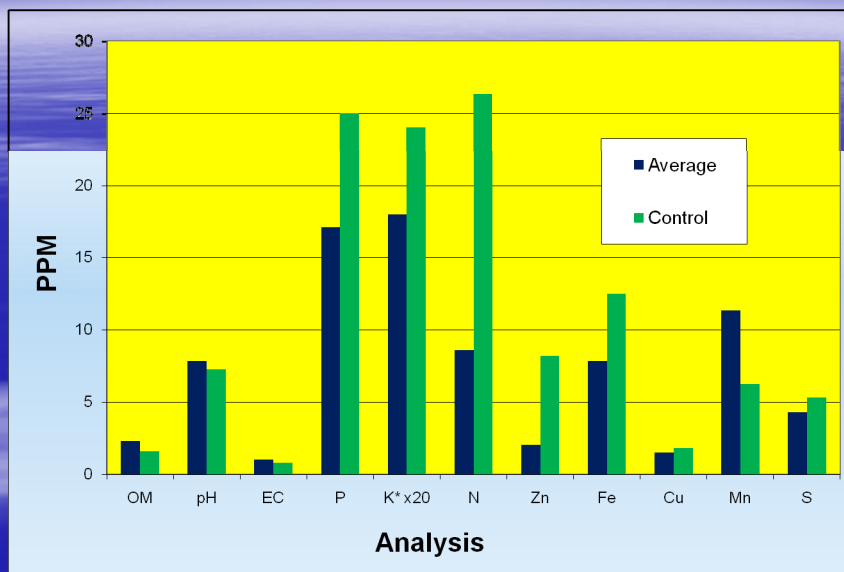


## F2F Research Plot Example

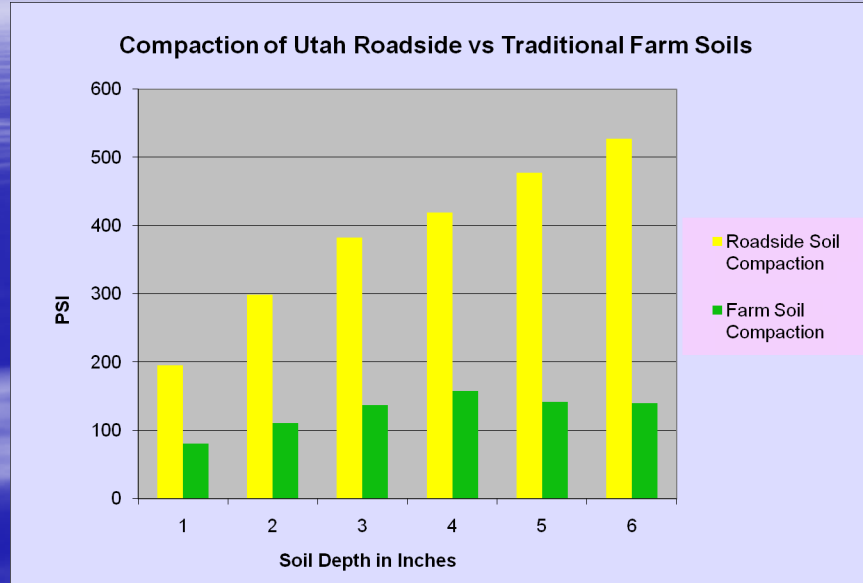
- 6 treatments
- 4 reps
- 4 locations
- 8' X 20' plots
- Crops tested
  - Canola
  - Safflower



## Roadside Soil Conditions



# Roadside Soil Compaction

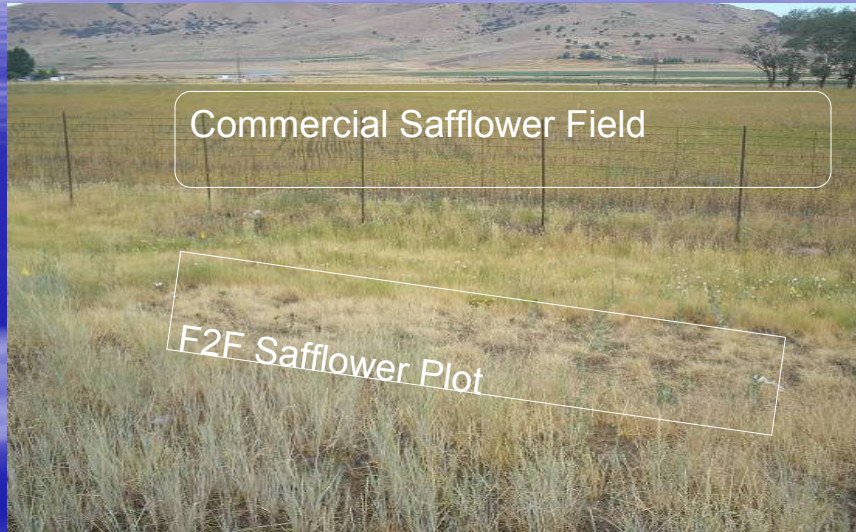


## A Closer Look at Planting

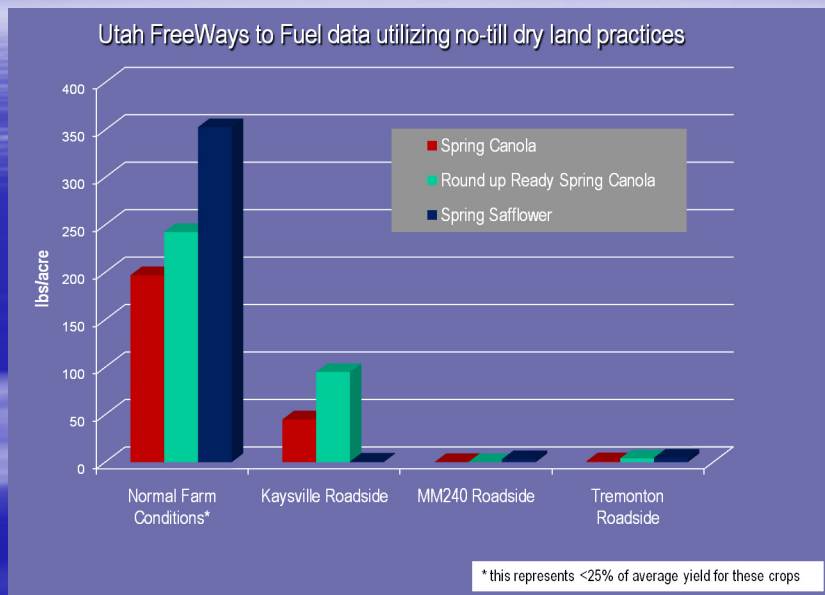
- How did compaction affect planting?



# Traditional vs Roadside



# Yield Data 2007/2008



## Hypothesis for Low Crop Yield

- Extreme Climatic Conditions
  - Precipitation
    - Some of the lowest on record
  - Temperature
    - Some of the highest on record
- Extreme Compaction
- Planting Technique

## FreeWays to Fuel Alliance

- Top Tier Universities
  - Washington State University, Iowa State, Auburn, Michigan State University, Montana State, North Carolina State University, University of Idaho, State University at New York – Cobleskill, Penn State University
- Corporate
  - New Holland – tractor donation
  - Great Plains – drill equipment donation
  - Aerway Ag – aerator donation
- Government
  - State Departments of Transportation
  - DOD Interests
  - State Energy Departments

# RSL Research Focus



- Simulate roadside compaction and soil quality
- Evaluate plant establishment techniques

# RSL Research Focus (cont.)

Compaction Relief



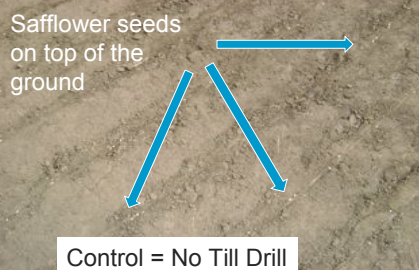
Seeding Pass



Culti-Planting



## Initial Results



VS



## Greenhouse Study



- Evaluate Depth of Emergence with Relative Compaction

## Other Crops

- Investigation of Other Crops
  - Dwarf Sunflower
  - Fall/Winter Safflower
  - Camelina
  - Gumweed
  - Annual Flax
  - Mustard
  - Perennial Biomass (i.e. grasses, legumes)

## Possible Locations

- Estimated 10 Million Acres From:
  - Roadsides
  - Military installations
  - Airports
  - Brownfields
  - Railroads
  - Power companies
  - Tribal Lands
  - Landfills

## Biomass to Liquid (G2)

- Biomass to Liquids
  - Thermal Platforms to transform biomass into liquid fuels



## References

- <http://www.fhwa.dot.gov/ohim/onh00/onh2p5.htm>
- <http://www.aar.org/PubCommon/Documents/AboutTheIndustry/Statistics.pdf>
- [http://www.census.gov/Press-Release/www/releases/archives/facts\\_for\\_features\\_special\\_editions/001573.html](http://www.census.gov/Press-Release/www/releases/archives/facts_for_features_special_editions/001573.html)
- [http://www.defenselink.mil/dbt/cjp\\_etp07\\_comm\\_best\\_practice.html](http://www.defenselink.mil/dbt/cjp_etp07_comm_best_practice.html)
- Comparisons based on Private Production Costs for Direct Seeded Winter Canola after Summer Fallow, 14" rainfall zone, Whitman County, Washington 2006