Can Biomass Contribute to the Solution?

Hawaii Energy Policy Forum

Briefing and Policy Dialogue

Potential of Biofuels to Help Meet Hawaii's Renewable Energy Goals

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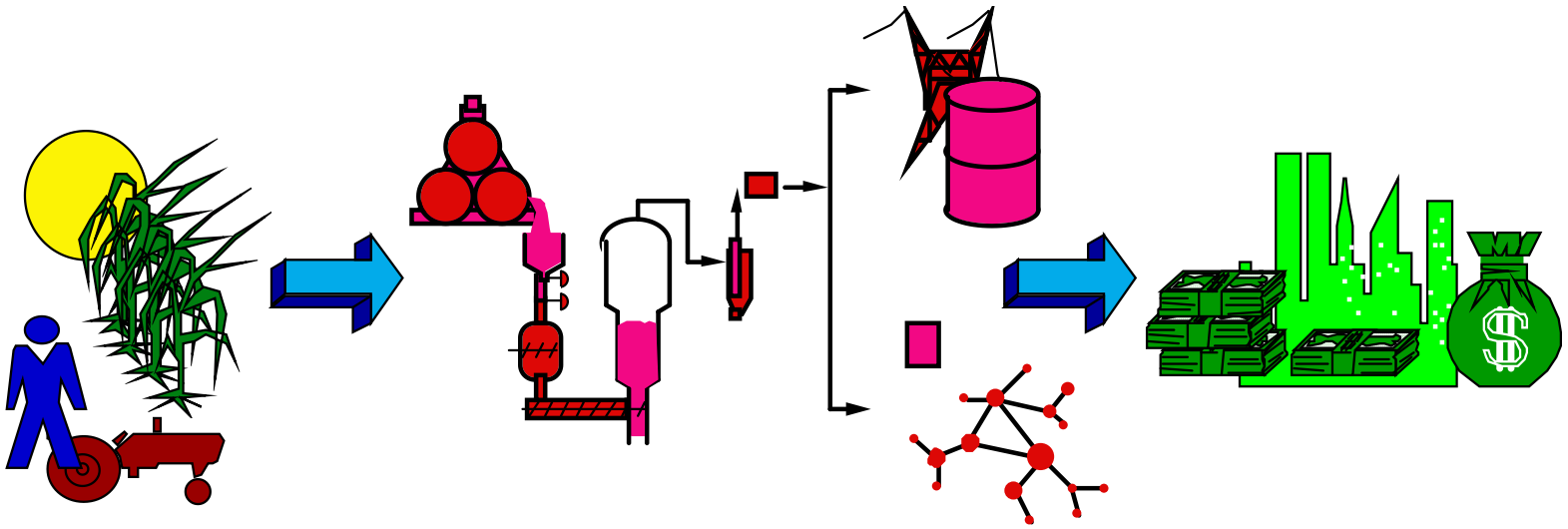
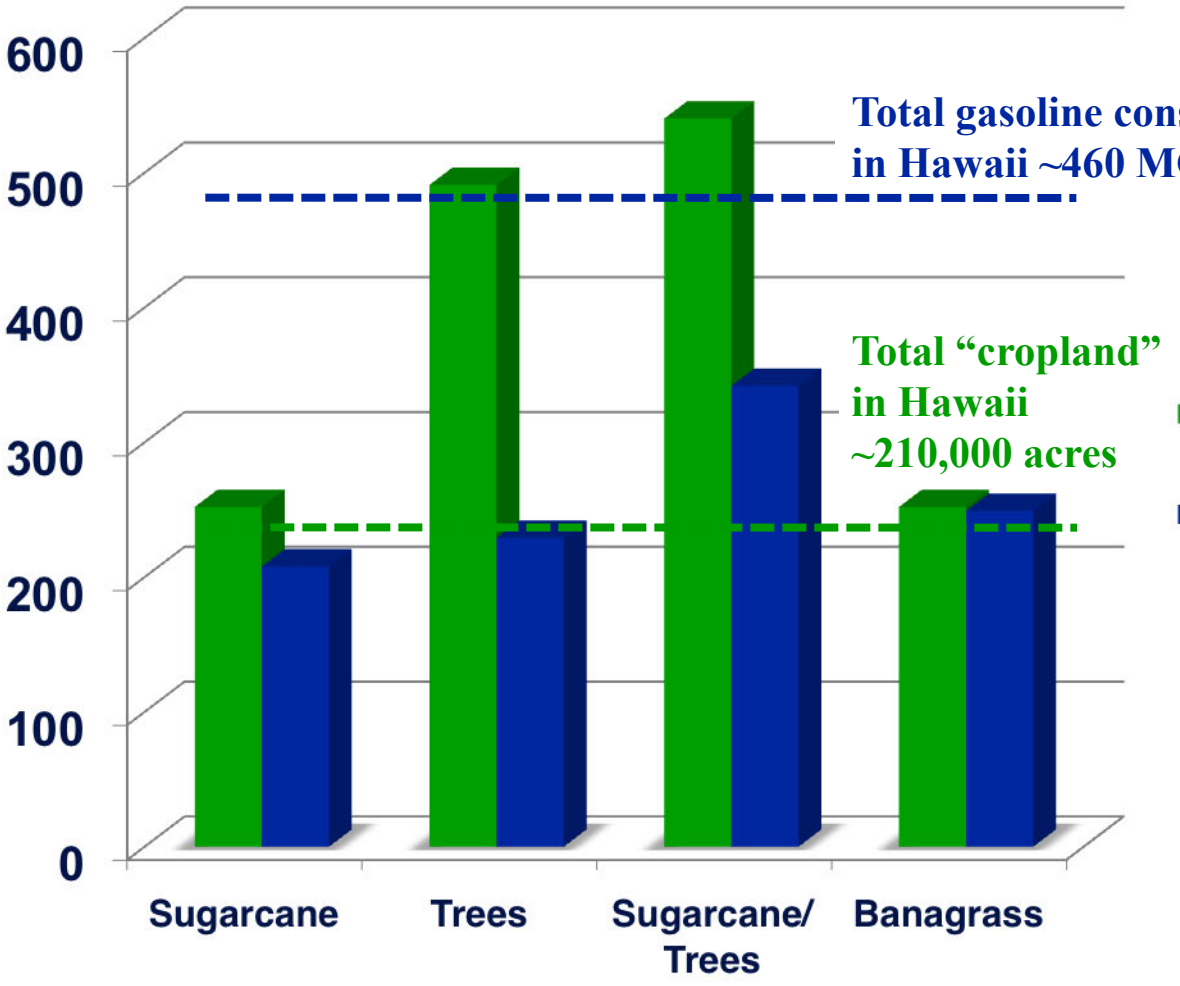


Charge to Panelists – Address the Following

- Potential for biofuels to help meet Hawaii's renewable portfolio goal of 40% renewable energy by 2030?
- Most promising feedstocks and conversion technologies?
- Best and highest use of biofuels?
- Major obstacles against meeting full potential?
- Additional government incentives and policy changes?

Question: Can Biofuels Help Meet Hawaii's Renewable Portfolio Goal?

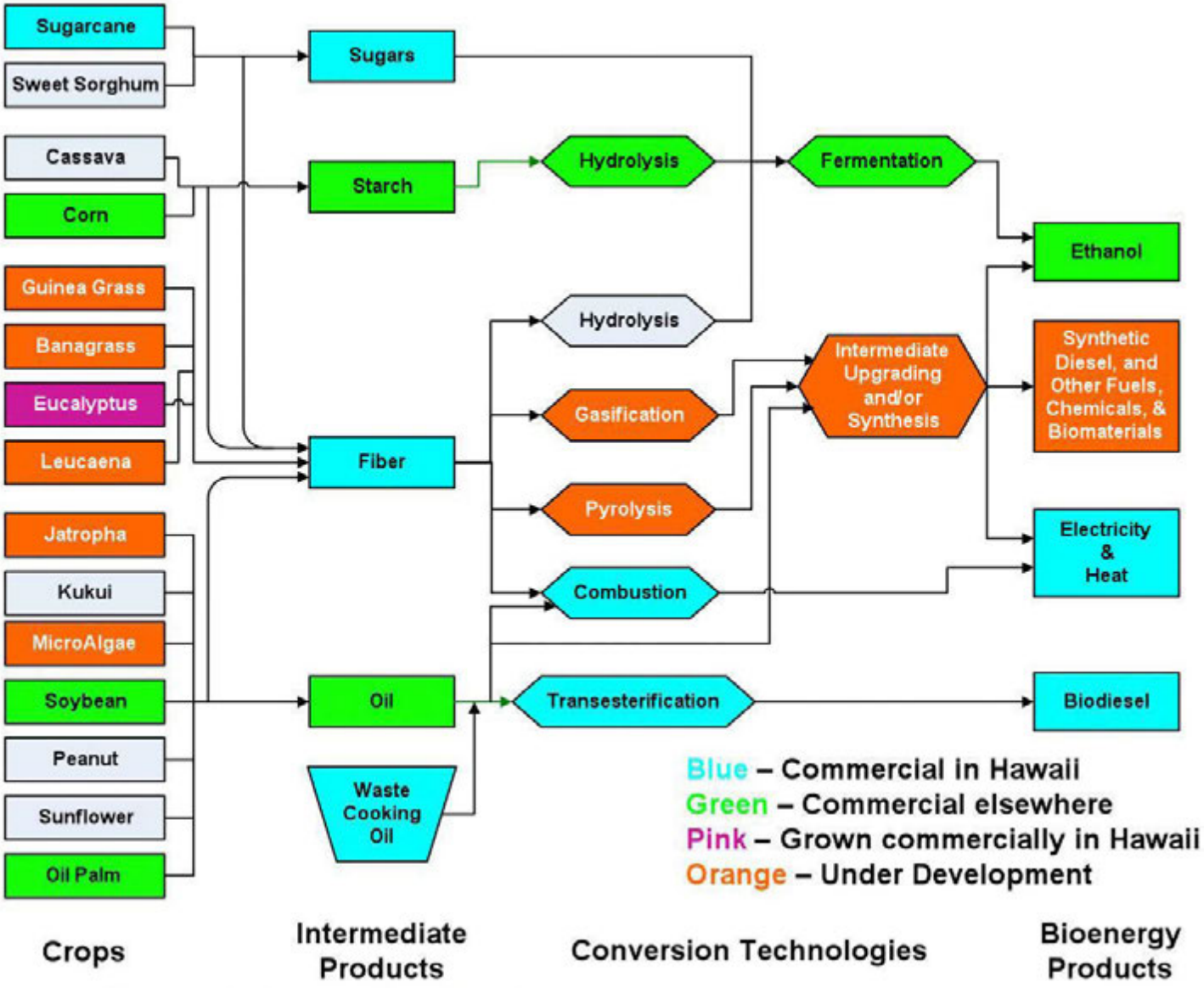
Consider Agricultural Lands with Large Landowners



Note: All assume the availability of land, water, and cellulose to ethanol technology

Reference: Keffer *et al.*, 2009

Question: Which Feedstock/ Conversion Technology?



Reference: Khanal et al., 2009

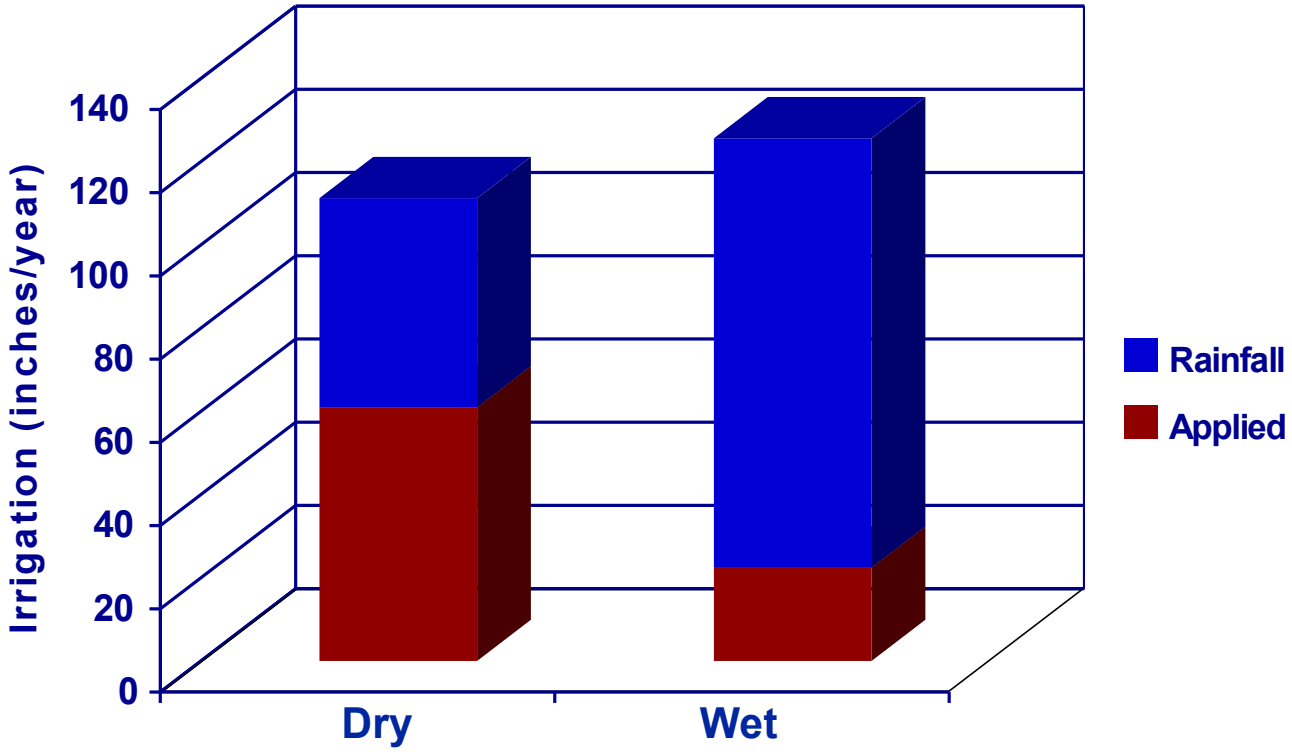
Plausible Scenarios

Scenario – Energy Crop to End Product	Feedstock Yield (per acre)	Conversion Yield to End Product	Energy End Product	Petroleum Equivalence
Sugarcane to Ethanol (biological conversion)	16.5 tons dry matter (40% sugar:60% fiber)	140 gal/ton sugar, 70 gal/ton fiber (+ fiber for parasitics)	1200 gal ethanol	800 gal gasoline
Banagrass to Ethanol (biological conversion)	22 tons fiber	70 gal/ton	1540 gal ethanol	1000 gal gasoline
Bangrass to Electricity	22 tons fiber	25% net efficiency	26.4 MWh	1500 gal diesel
Banagrass to Hydro-carbons via Pyrolysis	22 tons fiber	20% HC on fiber	1320 gal HC	1320 gal HC
Oil Crops to Biodiesel	300 gal vegetable oil	1 biodiesel: 1 vegetable oil	300 gal biodiesel	<300 gal diesel

Question: What Obstacles and Potential Fixes?

- Productive, affordable, and stable lands
- Affordable and dependable supplies of water
- Adequately trained and compensated workforce
- RD&D in bioenergy and biobased products
- Incentives and supportive policy foundation

The Water Challenge



	Dry (61 inches of applied irrigation per year)			Wet (22 inches of applied irrigation per year)		
Water Rate ($/1000 gal)	0.10	0.25	1.00	0.10	0.25	1.00
Water Cost ($/ac-y)	165	413	1,654	61	153	611
Water Cost ($/gal EtOH) *	0.15	0.38	1.52	0.06	0.16	0.65
Water Cost (% of value) *	6	15	61	3	6	26

*EtOH yield assumed to be 950-1100 gal/ac-y; EtOH valued at $2.50/gal

The Workforce Challenge

- >2000 workers will be needed to grow and process 100,000 acres of energy crops
- >75% will need special skills
- >20% will need to be college trained in STEM fields
- >90% are not employed in the bioenergy industry today
- 100% will need housing