



HAWAII

BioEnergy



**Power to the People:  
Agriculture as a Base for a New  
Green Economy**

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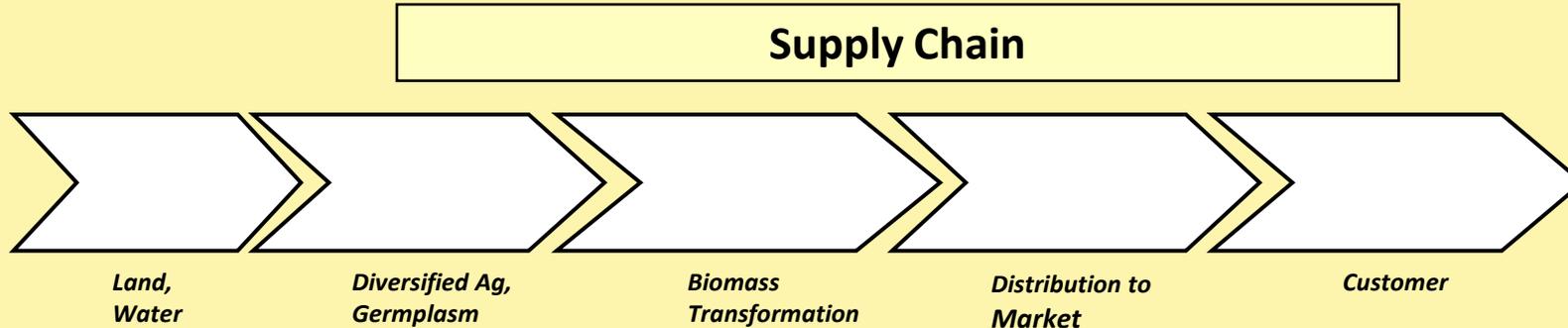
**September 24, 2010**



# Liquid “High Density” Green Fuels: It’s all about the biomass

## Hawai’i Energy and Food Challenges

- ❑ Hawaii runs on high density fuels
- ❑ A need to produce both food and energy
- ❑ Relatively small and isolated parcels of land present logistical and scale challenges



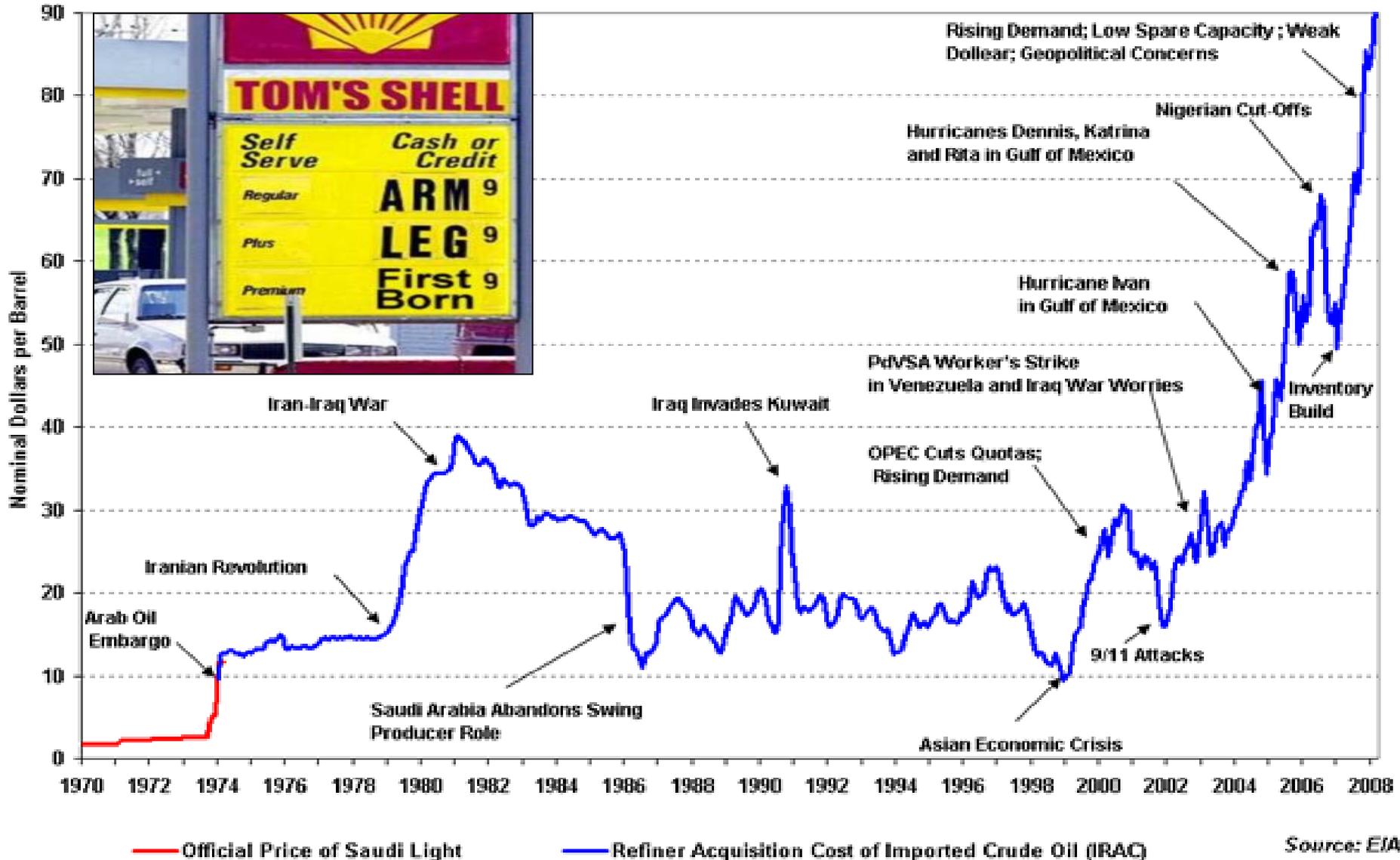
- Sustainable practices
- Diversified crops
- Efficient water management
- Increased land productivity

- “Recycle” waste streams
- Food and Fuel





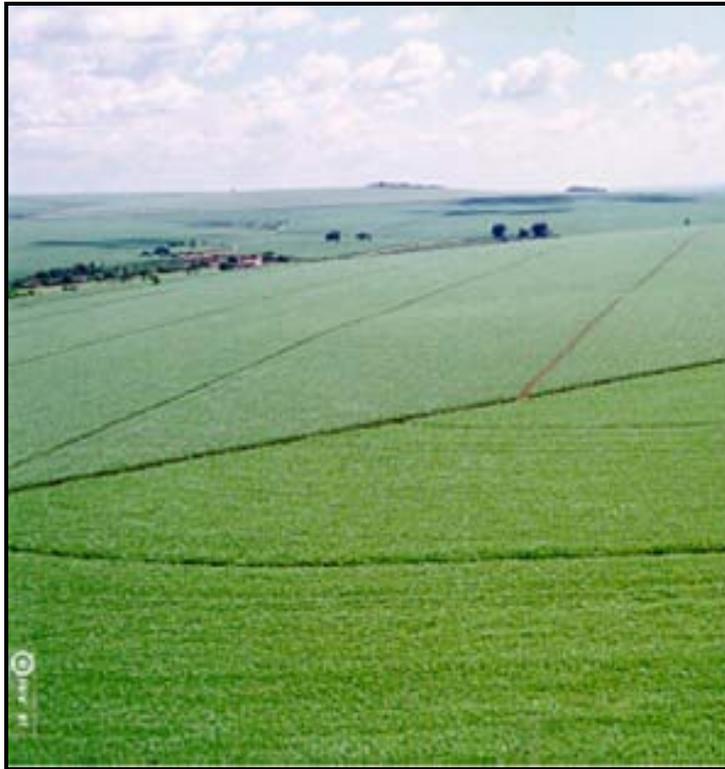
# Oil Prices Spike and Fall: ...but the trend is obvious





# Sugarcane to Ethanol and Power

The conventional “standard” for biomass to energy





# New Crop Cultivars: Changing Goals Allows us to Change Tools Energy Cane and Sorghum vs Conventional Cane

- Energy Cane data courtesy of Fernando Reinach, Canavialis – Brazil
- Photos courtesy of Texas A&M University

Fraction	Conventional Sugarcane tons/acre (DW)	Energy Cane tons/acre (DW)	High Biomass Sorghum (DW)
Sucrose	7.5	9.4	7.0
Fiber	7.5	17.0	25
Total	15.0	26.4	32



- new hybrid Sorghum varieties (eg. CERES – Thousand Oaks, CA and Texas A&M, College Station, Texas)
- Sorghum uses 30% less water per ton of biomass produced than sugarcane



# “Refocusing” Agriculture: The base for a sustainable, economic and secure Hawai`i (“back-of-the-envelope” estimates)

**Cane as an Algae “Feedstock”**

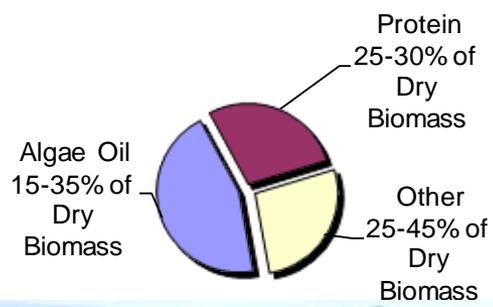
1.0 acre cane or sorghum at 50 wet tons per acre

- Liquid fuel
- 15 tons CO<sub>2</sub>/acre on processing



## One metric ton of algae

- 15 tons CO<sub>2</sub> produces 5 tons of algae**
- 5 tons of algae/acre
    - 300 - 700 gallons of oil
    - 1.3 tons of protein
  - Algae ponds - ~10% of land available for cane or sorghum
  - 10,000 acres of cane or sorghum would support 1000 acres of algae and support generation of 13,000 tons of animal feed





## *Liquid “High Density” Green Fuels: It’s all about the biomass*



HARC – July 2010 (55 days)



HARC – August 2010 (90 days)



# ***Mahalo***