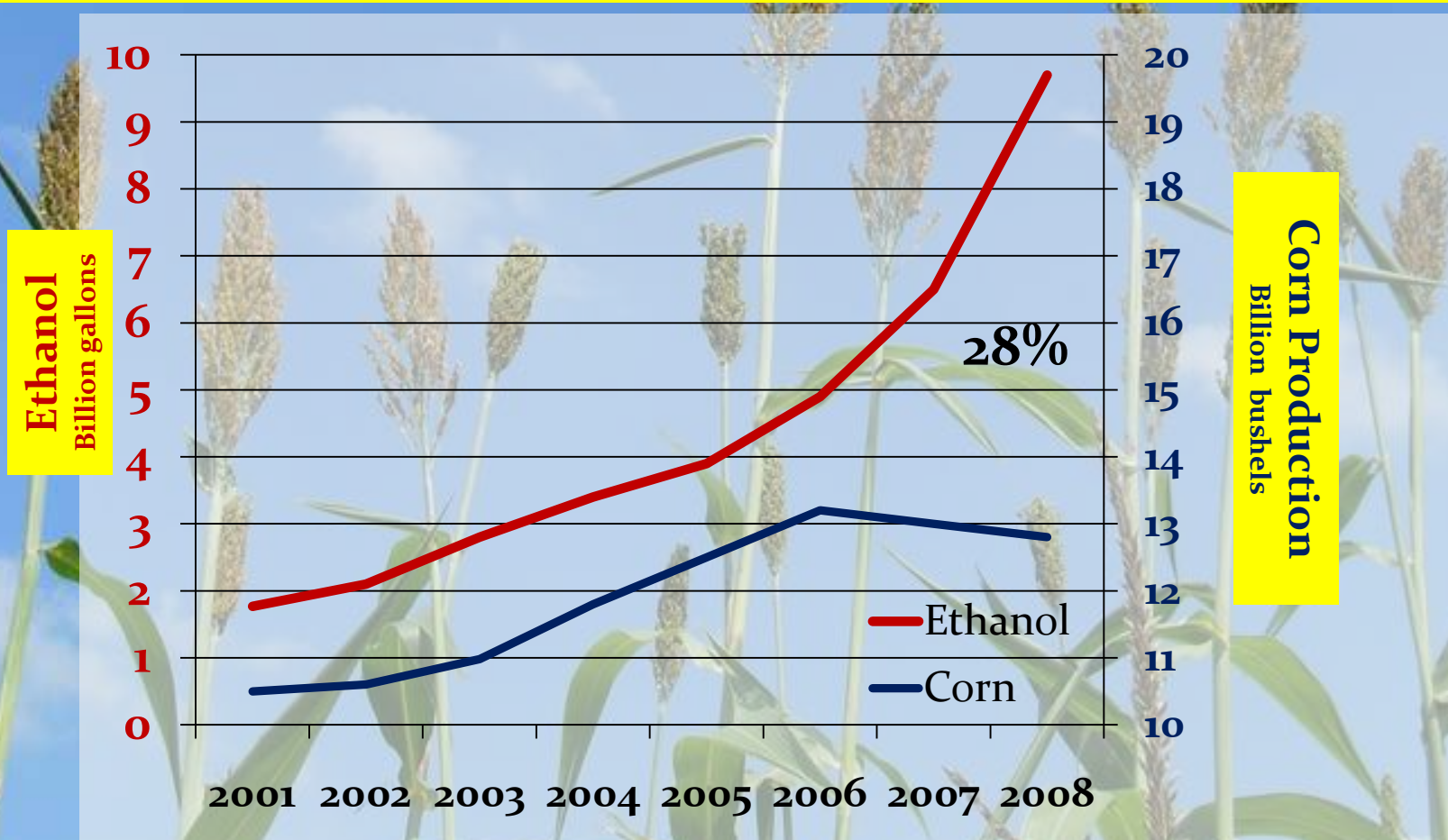


**Land, labor, and energy efficiency  
of alternative biofuel feedstock  
crops at three farm scales.**

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# Corn and Ethanol Production



**2009**

**Bio-intensive**  
3.4m x 6m

**Small Farm**  
38m x 22m

**Market Garden**  
7m x 18m

50 m

N

Food

Fuel

**Sweet  
potato**

Food

Fuel

**Corn**

Food

Fuel

**Sweet  
Sorghum**

Food

Fuel

**Soybean**



**2009**

**Bio-intensive**  
3.4m x 6m

**Small Farm**  
38m x 22m

**Market Garden**  
7m x 18m

50 m

N

**Crop Rotation**

follows

**Corn**

follows

**Sweet potato**

**Soybean**

follows

follows

**Sweet Sorghum**

- Food Fuel **Sweet potato**
- Food Fuel **Corn**
- Food Fuel **Sweet Sorghum**
- Food Fuel **Soybean**

# Biointensive

❖ John Jeavons (2002)

❖ 20m<sup>2</sup>

❖ Hand Labor

❖ Tillage

❖ Maintenance

❖ Harvest

Jeavons, J. *How to Grow More Vegetables...* Ten Speed Press, Berkeley, CA 2002



# Market Garden

- ❖ Small Equipment and Hand Labor
  - ❖ BCS (12hp and 7hp)
  - ❖ Earthway Seeder
  - ❖ Hand Tools



# Small Farm

## ❖ Conventional Management

❖ 836 m<sup>2</sup>

❖ Four Wheel Tractors (30-40hp)

❖ Two Wheeled Tractors (BCS 12hp)

❖ Hand Labor



# Methods

## ❖ Plots

- ❖ Plots were evenly divided into four strips
- ❖ Corn, Soybean, Sweet Sorghum, Sw. Potato

## ❖ Energy and Labor

### ❖ Metabolic Equivalent of Task (MET)

- ❖ 2.5, 4.0, 8.0 (convert 5kJ per MET minute)

### ❖ Fossil Energy

- ❖ 32MJ L<sup>-1</sup> for gasoline and 36MJ L<sup>-1</sup> for diesel

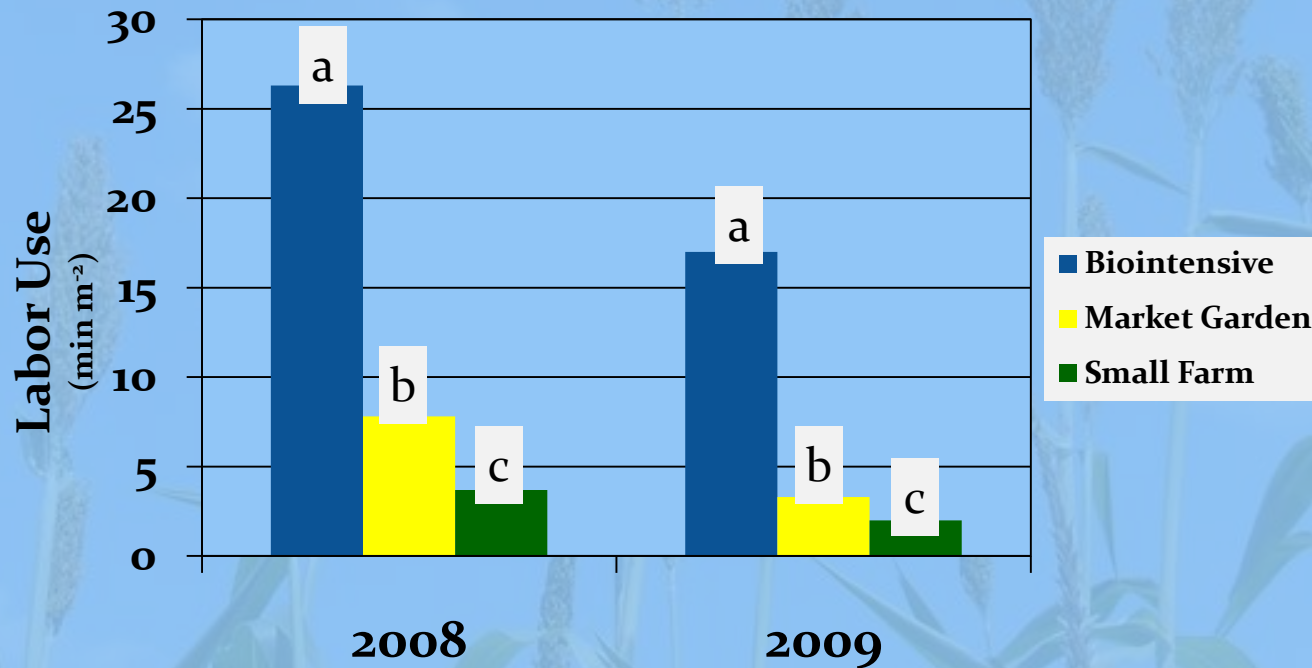
### ❖ Ethanol Yield (Potential)

- ❖ 350 L Mg<sup>-1</sup> of corn, 58 L Mg<sup>-1</sup> sorghum, 167 L Mg<sup>-1</sup> sweet po.



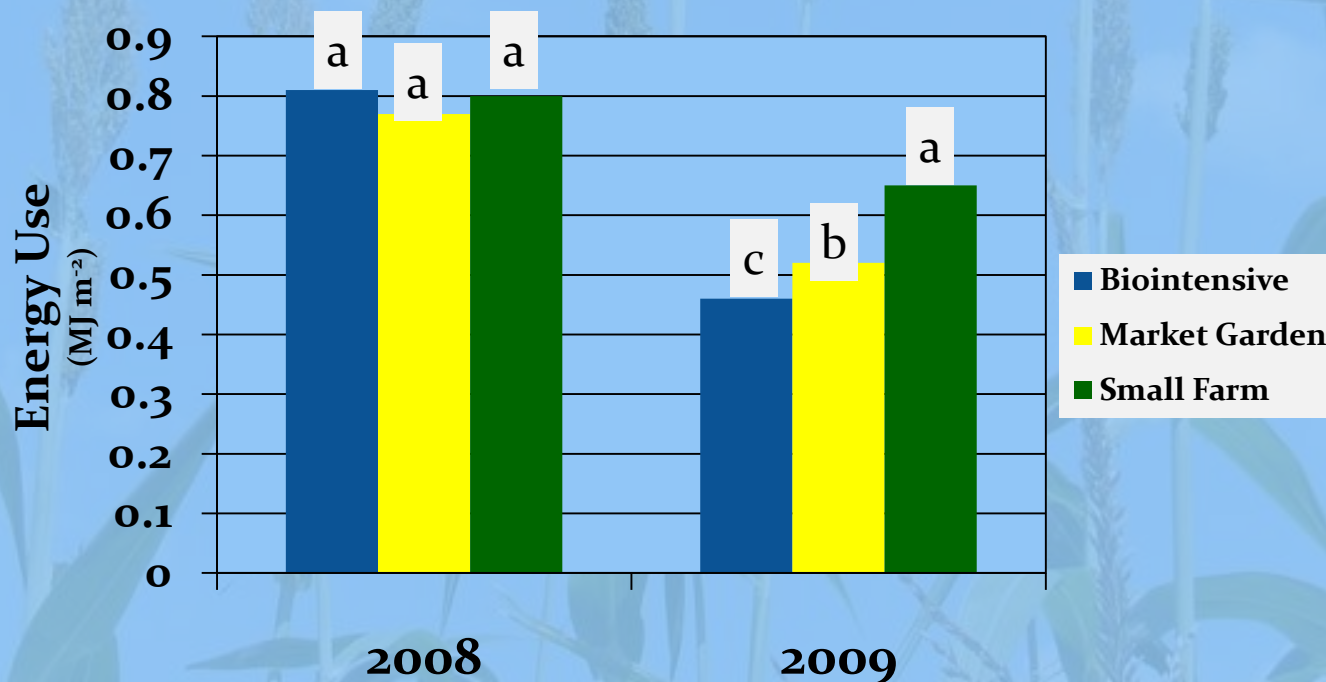
# Results

❖ Biointensive used the most labor per unit area



# Results

- ❖ Energy use was not significantly different between farm scales in 2008
- ❖ In 2009, the small farm had the great energy use per unit area, followed by market garden, then biointensive



# Results

