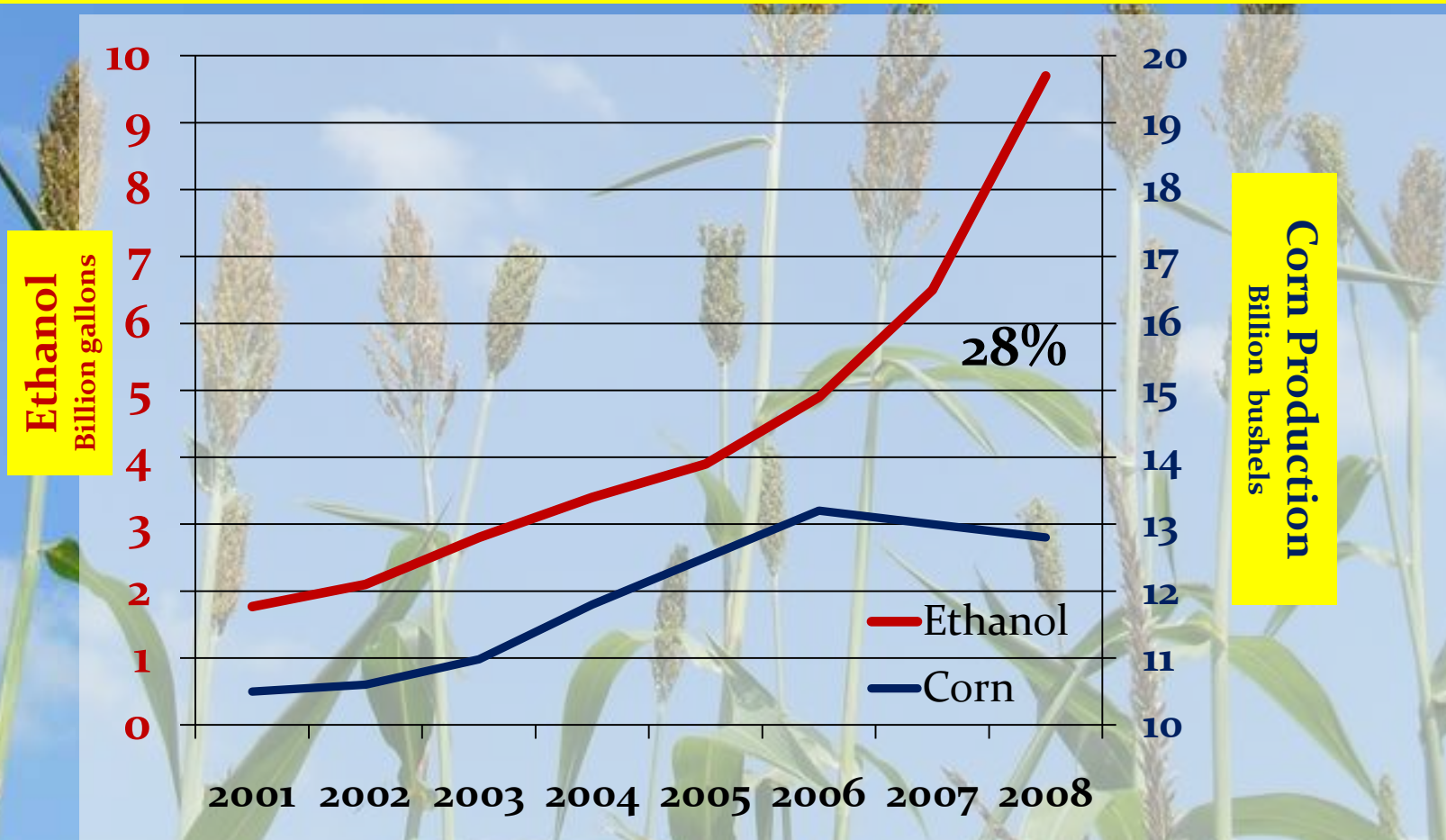


**Land, labor, and energy efficiency
of alternative biofuel feedstock
crops at three farm scales.**

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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	Sweet potato
	Fuel	
	Food	Corn
	Fuel	
	Food	Sweet Sorghum
	Fuel	
	Food	Soybean
	Fuel	



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)

❖ 20m²

❖ 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 m²

❖ 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⁻¹ for gasoline and 36MJ L⁻¹ for diesel

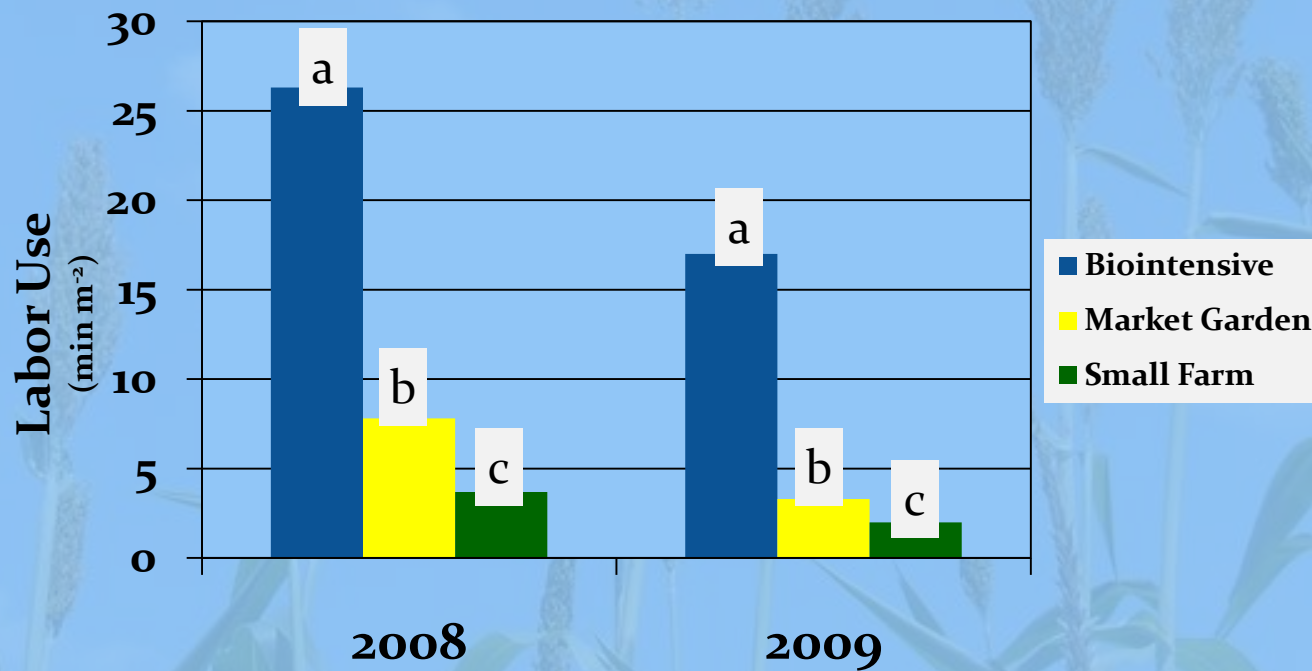
❖ Ethanol Yield (Potential)

- ❖ 350 L Mg⁻¹ of corn, 58 L Mg⁻¹ sorghum, 167 L Mg⁻¹ sweet po.



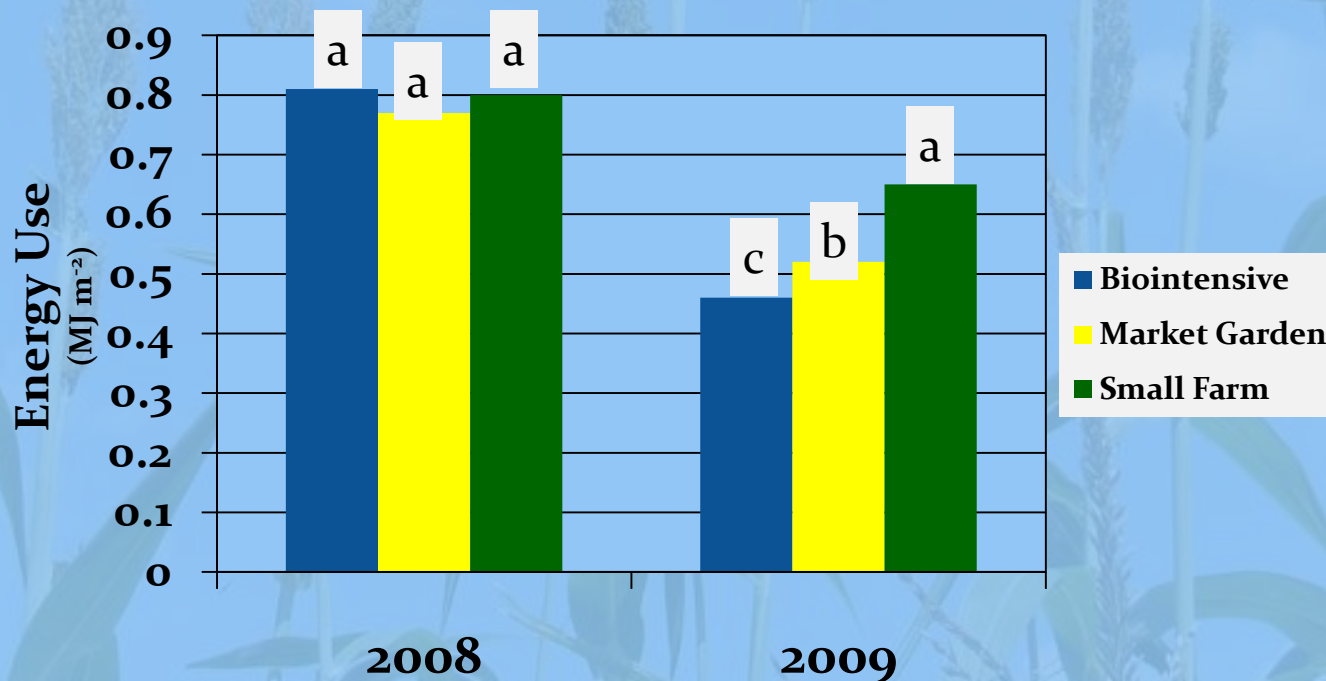
Results

❖ 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

