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# Energy From Agriculture:

## New Technologies, Innovative Programs & Success Stories

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*December 14-15, 2005*



*St. Louis, Missouri*

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**Farm Foundation**

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**USDA's Office of Energy  
Policy and New Uses**



Farm Foundation



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## Farmer Ethanol in a “Flat World”

*How Information Technology is changing  
the nature of fuel ethanol operations*

*Tony Crooks  
USDA, Rural Development*



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## ***“Role of Information Technology in the Fuel Ethanol Industry”***

- **Two workshop/focus panels of industry experts**
  - **Minneapolis and Omaha (March ‘05)**
  - **Specialists in – Commodity futures (NYMEX, CBOT), finance, producer assns., legal structures, information technology, plant management, R&D, energy, procurement/logistics**
  - **USDA, University of Minnesota, and Informa Economics (formerly Sparks Commodities)**
- **12 follow-up interviews**
  - **Plant managers, directors, industry principals**

Badger State Ethanol, Monroe, WI





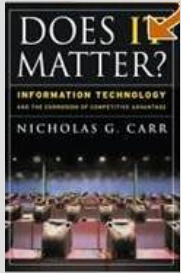


## ***Study background/motivation***

- **Rural Development** – investments, opportunities, strategies
- **Structurally, the emerging fuel-ethanol industry is uncharacteristic of typical agricultural processing**
  - Fragmented balance – multinationals v. farmer-owned plants
  - Dispersed ownership/production
  - Few integration/assimilation activities
- **Information technology (IT) is a driving force in business**
  - operations, strategies, structures, ownership, and performance
    - Does IT Matter?, Carr
    - IT Doesn't Matter, Business Processes Do, Smith and Fingar
    - The Only Sustainable Edge, Hagel and Brown
    - The World is Flat, Friedman

Ace Ethanol LLC, Stanley, WI

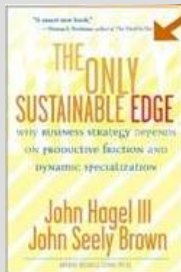




- **Carr, "Not so much ..."**
  - IT same as other tech: railroads, electric power, telephone
  - From proprietary resource to a cost of doing business
  - Impacts erode with availability and affordability

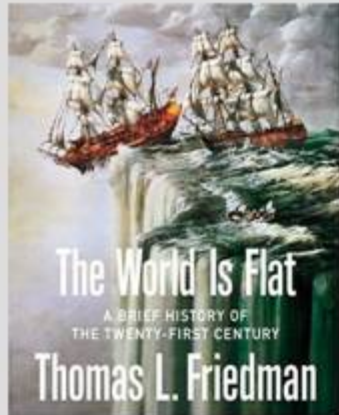


- **Smith and Fingar, "Not so fast ..."**
  - IT as industry maybe, but not IT business applications
  - 1<sup>st</sup> 50 years of data – storage, processing, transport
  - Next 50 years of BP -- storage, processing, transport



- **Hagel and Brown, "Just fast enough ..."**
  - Sustained business success depends on "productive friction" and "dynamic specialization"
  - IT enables work to be: digitized, decomposed, distributed





## *Changing nature of business*

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- From vertical “Command and Control” hierarchies to:
  - Horizontal, multi-dimensional, multi-modal, collaboration
  - A global, Web-connected, IT-leveled, playing field
  - “Real time” sharing and distribution of knowledge/work -- regardless of: Geography, Distance, Language
- From simple “make or buy” decisions to “digitize, decompose, and move work around”
- From labor v. capital to employee v. consumer







## ***Study objectives***

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**Is the present ethanol industry structure stable or transitional toward concentration?**

**How has IT altered the playing field for the medium-sized firm?  
Re: Scale economies, market access, supply/value chain coordination, finance/investment, etc.**

**Is IT serving as a proxy for vertical integration?**

**To what extent is IT lowering transaction costs across --  
enterprises, business processes, and/or functions?**

**What are the Rural Development implications?**







## *Industry structure, then and now*

### **Then (mid 80's to early 90's):**

- Top 3 firms (80% of production) and 'the rest' (~17 plants)
- 1 billion production capacity
- Construction costs ~ \$2.50/gal
- Conversion efficiency ~ 2.2 gal/bu
- 52 staffing FTEs
- 320 operation days/year

### **Now:**

- Fragmented structure – Top 3 firms (31%), 44 of 71 plants F/O
- 4+ billion production capacity
- Construction costs ~ \$.98/gal
- Conversion efficiency ~ 2.75 gal/bu
- 35 staffing FTEs
- 360 operation days/year

Platte Valley Fuel Ethanol, Central City, NE





## *How did industry get 'here'?*

- **Federal/State policies & incentives**
  - Natural progression of an emerging industry
  - Classic “production push” agricultural business model
- **Farmer-owned facilities**
  - Associated capital constraints
- **\$50+/barrel oil**
  - From commodity-ingredient to energy substitute?
- Cheap corn, Growers' associations, Other things ...
- Information technology?

Commonwealth Agri Energy LLC, Hopkinsville, IL







## *The “cookie-cutter” ethanol plant*

- “Put down” quite easily in most any location
- A “one-stop ethanol shop” – Feasibility to turn-key and beyond
  - Feasibility/Business plan
  - Fund raising/Financing
  - General contracting/Licensing/Permits
  - Marketing/Procurement agreements
  - General/Plant management
- Hand holding
  - Producer-investors through the entire process
  - Operations contracts into 5<sup>th</sup> marketing year
- Not your father’s “still on the hill”





## ***IT and the ethanol plant “franchise”***

- **Process design technology**
- **Distributed control systems**
  - **Dynamic specialization**
  - **Process networks**
  - **Performance fabric**

Midwest Grain Processors Co-op, Lakota, IA







# *Process design technology*

- **Old plants:**
  - Analog loop controls
    - Lever, gauge, & technician for each process component
  - Sophisticated maintenance, strip chart recording
- **Standardized design plants:**
  - Integrated circuitry
    - 1 technician for many processes
  - AI monitored, real time updates
  - Broin, Fagen/ICM, Delta T





# ***Distributed control systems***

***Consolidation of process management over many enterprises/plants/companies simultaneously***

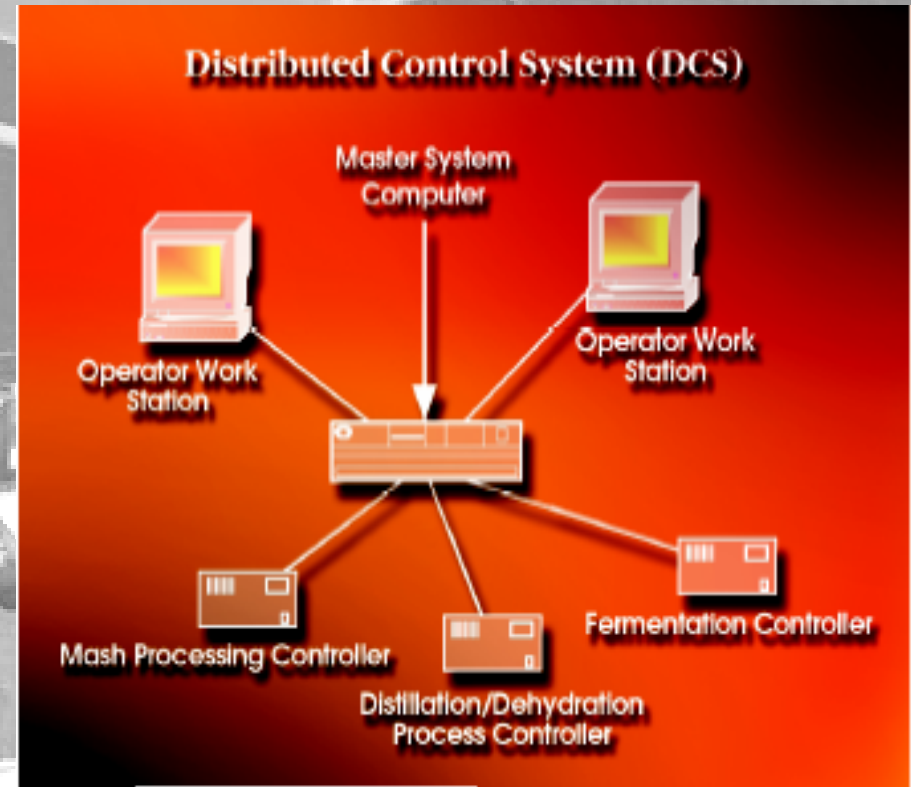
**Massive data collection/analysis effort**

**Business/bio process metrics and benchmarking**

**Precise factor/product coordination**

**Sourcing/usage specifications**

- **Staff reduction**
- **Productivity gains**
- **Cost savings!**



KAAPA Ethanol, Minden, NE







# ***Dynamic specialization***

***Outsourcing, In-forming & Off-shoring to accelerate growth***

## ***Innovation -- incentives, opportunities, capabilities***

- **Marketing “partnerships”**
  - Ethanol, Distillers’ grains (DDGS)
- **Procurement “contracts”**
  - Feedstock, Energy, Inputs (Enzymes)
- **Management “agreements”**
  - Operations/Process benchmarking
  - Trading/Risk mitigation
  - Market analysis/Consulting
  - Transportation/Logistics

Western Plains Energy LLC, Oakley, KS









## ***FAGEN/ICM services***

**Management** -- General management services, Contracted employees permanently at plant site, Strategic and daily management of plant operations, Group purchasing opportunities, Monthly **benchmark information** program

**Trading** -- Risk management/consulting services. Factor / product risk management -- corn, grain sorghum, natural gas / ethanol, gasoline; Market analysis services, Licensed commodity brokerage

**Ingredients** -- Grain origination, DDGS marketing services, Transportation logistics, Full accounts receivable responsibility, Credit risk assumption

**Fuels** -- Ethanol marketing (off-take contracts), Transportation logistics, Full accounts receivable responsibility, Credit risk assumption

<http://www.icminc.com/partnerships.aspx>

Agri-Energy LLC, Luverne, MN





## United Bio Energy client list

17 plants (13 F/O) – 58 contracts

Plant	Grain	Marketing		Management				
	Origination	Ethanol	DDGS	General	Plant	Risk	Consulting	Project
Amaizing Energy	X	X						
Badger State		X						
Big River Resources	X	X	X	X		X		
East Kansas Agri Energy	X	X	X	X		X		
Golden Triangle		X						
Hakeye Renewables - Fairbank		X						
Hakeye Renewables - Iowa Falls		X						
KAAPA							X	
North Country Ethanol	X	X	X	X		X		
Platte Valley Fuel Ethanol	X	X	X	X		X		
Trenton Agri Products		X			X	X		
US Bio Energy - Albert City	X	X		X	X	X		X
US Bio Energy - Superior	X	X		X	X	X		X
US Energy Partners	X	X	X			X		
Western Plains Energy		X						
Western WI Renewable Energy		X	X	X		X		X
White Energy				X	X	X		X

Big River Resources LLC, W. Burlington, IA







# ***Process networks***

*Mobilizing specialized activity across many enterprises*

- **Supply chain management**
  - Marketing
  - Procurement
- **Product innovation/commercialization**
  - DDGS product development
    - From waste stream to revenue stream
  - Bio refinery concept
    - “Up front” technologies/fractionation
- **Customer relationship management**
  - Complementary product and service providers

VeraSun Energy LLC, Aurora, SD





## ***Performance fabric***

***Weaving together process networks***

- **Enabling coordination across:**
  - **Enterprises, companies, specialties**
- **That are dispersed:**
  - **Geographically, institutionally, dimensionally**
- **And are the basis for using “*productive friction*” to build and accelerate capabilities**
  - **500 mg/y ethanol marketing requirement problem**
  - **DDGS quality, reliability, & sufficiency problem**
  - **Bio-diesel production costs problem**







## ***Study results -- IT matters!***

### **IT and ethanol industry structure:**

- Plant operations and costs**
- The nature of the firm**
- Relationships between firm and industry**
- Future dynamics**

Trenton Agri-Products, Trenton, NE





## *IT and plant operations*

- ***Fosters standardization & “best practices”***
  - Strips costs out of system
  - Mitigates risk
  - Squeezes time loss out of system
    - Speeds construction – ground breaking to turnkey
    - Reduces downtime – 320 to 360 days of operation/year
- **Facilitates capital inflow**







## ***IT and the nature of the firm***

- **Digitizes and decomposes activities for outsourcing**
  - Alters asset location requirements
  - Encourages labor mobility
- **Further separates ownership from management**
- **Alters the skill sets needed for management and labor**
- **Encourages firm transformation**

Central MN Ethanol Co-op, Little Falls, MN





## *IT and the firm's relationships*

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- Gives rise to the ethanol “Franchise”
  - Supports contracts-based industry structure
  - Creates “Web” of collaboration --
    - Enterprises, companies, specialties
- Reduces bounds of uncertainty
  - Better understanding of risks helps to:
    - Reduce lenders’ equity participation requirements
    - Reduce interest rates and the overall costs of capital
    - Invite participation from outside investors
- ***Alters industry/market structure***
  - **Physical capital v. Aggregating information assets**
  - **Production based v. Intellectual capital based**







## *IT and the ethanol industry's future*

### *Looking to the future, we ask:*

- What else can be digitized, decomposed, outsourced?
- From where will the talent to continue operations come?
- Will IT erode the same advantages it once endowed?

Exol Corp., Albert Lea, MN





## ***Rural Development implications***

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- ***Develop human capital/capacity of rural residents***
  - IT capability/access is a rural business cornerstone
  - IT skill sets critical to rural business development
- ***Connect RD investments to rural IT-based businesses***
  - Full adoption of IT improves:
    - Relative business risks
    - Chances of RD program success
    - Long term economic prospects/growth

Agri-Energy LLC, Luverne, MN

