Energy From Agriculture:
New Technologies, Innovative Programs & Success Stories
December 14-15, 2005 | St. Louis, Missouri

Farm Foundation | USDA's Office of Energy Policy and New Uses | NRCS | Rural Development

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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
  - 1st 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

- 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

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Study objectives

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?

Big River Resources LLC, W. Burlington, IA

USDA Rural Development

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

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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

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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 5th marketing year
- Not your father's "still on the hill"

Midwest Grain Processors Co-op, Lakota, IA

USDA Rural Development

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

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Slide 1: 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

Husker Ag LLC, Plainview, NE

Slide 2: 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!

Distributed Control System (DCS)

Master System Computer
Operator Work Station
Operator Work Station
Mash Processing Controller
Fermentation Controller
Distillation/Dehydration Process Controller

KAAPA Ethanol, Minden, NE

Slide 3: 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

Slide 4: Marketing "partnerships"
Aventine Renewable Energy, 11 plants ~ 560 mg/y

Aventine Renewable Energy, Inc.

Aventine Partners	Location
Aventine Renewable Energy, Inc.	Pekin, IL
Ace Ethanol	Stanley, WI
Adkins Energy	Lena, IL
Agri-Energy	Luverne, MN
Glacial Lakes Energy	Watertown, SD
Heartland Grain Fuels	Aberdeen, SD
Heartland Grain Fuels	Huron, SD
Nebraska Energy	Aurora, NE
Quad County Corn Processors	Galva, IA
Reeve Agri-Energy	Garden City, KS
VeraSun Energy	Aurora, SD

Glacial Lakes Energy, Watertown, SD

Slide 5: 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

Slide 6: United Bio Energy client list
17 plants (13 F/O) – 58 contracts

Plant	Grain Origination	Marketing Ethanol	Marketing DDGS	Management General	Management Plant	Management Risk	Management Consulting	Management Project
Amazing 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						
Hawkeye Renewables - Fairbank		x						
Hawkeye Renewables - Iowa Falls		x						
KAAPA								
North Country Ethanol	x	x	x	x		x		
Platte Valley Fuel Ethanol	x	x	x	x		x		
Trenton Agri Products		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	x

Big River Resources LLC, W. Burlington, IA

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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

Big River Resources LLC, W. Burlington, IA

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

Little Sioux Corn Processors LLC, Marcus, IA

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

- **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

High Plains Corp., York, NE

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

- *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