Why Do Food and Other Agricultural Commodities Cost More?

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John A. Miranowski
Professor of Economics
Director, Institute of Science and Society
Iowa State University
Higher energy prices on production agriculture

- Impact production costs
- Impact output prices and “energy” input costs for consumers
- How do producers adjust?
  - Crops
  - Livestock
Environment surrounding higher food prices

- Higher energy prices and transportation costs
- Growing global demand for oil and livestock
- Competition for scarce land base
  - Food
  - Feedstock
  - Land use and landscape issues
  - Sustainability concerns
  - Carbon implications
The Ethanol Explosion

Source: Renewable Fuels Association and preliminary CARD projections
Projected Corn Utilization

Million Bushels

- Feed
- Ethanol
- Other
- Exports

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What is Driving the Price of Corn?

- Processor’s break-even price for corn:

  \[ P_{\text{Corn}} = 2.80 \times (P_G \times 0.667 + T_{\text{Credit}} + V_O + V_{\text{DDG}} - C_K - C_O) \]

- $60 per gallon price of crude oil translates into $2.07/gallon price of gasoline ($100 bbl oil is $3.45 P_G and $2.30 P_E)

- Sensitivity to current tax credit of $0.45/gallon ($1.25/bu)

- Long Run Breakeven Corn Price: $4.10/bu
What are the implications for agricultural commodities?

- Corn price driven by ethanol price driven by oil price; transportation and other costs are oil driven as well
- Growing global demand for crude oil and livestock products (FAPRI Study – 15B and 29B gal corn ethanol)
- Crop and livestock products competing for same domestic and global cropland base – all prices increase
- Growing opportunity cost of cropland and biomass fuels, both domestically and globally
- Need to differentiate between SR shocks and LR natural resource trends
Energy use and farm production expenses

- Direct energy consumes twice as many BTUs as indirect energy, but

- Direct energy accounts for 4-6% of 2006 farm production expenses and 12% of corn operating expenses

- Indirect energy inputs (fertilizer and pesticides) account for 15-16% of farm production expenses and over 50% of corn farm operating costs

- Energy use in crop and animal production
Energy's Share of Farm Production Expenses

Indirect energy
Direct energy
Total energy

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Direct Energy Costs Ratios in 2006: Major Crops

- rice
- wheat
- cotton
- soybean
- corn

Direct energy costs per dollar of total costs listed vs. Direct energy costs per dollar of gross value of production.
Direct Energy Costs Ratios in 2006: Livestock

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<th>Category</th>
<th>Energy Costs per Dollar of Total Costs</th>
<th>Energy Costs per Dollar of Gross Value of Production</th>
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How do higher energy prices impact agriculture?

• Energy’s input share and how has it changed over time

• Farmers’ respond to higher energy input costs
  – In shorter run, impact costs of production and net returns
  – In longer run, impact quantity supplied

• To livestock producer, corn and other feed grains are the largest energy input share

• Increasing opportunity cost of land (cash rents)
Production Cost Issues

• Long history of producers responding to real and relative energy prices
  – Substitute cheaper for more expensive inputs
  – Increase input use with higher output prices

• Energy use with energy price shocks – how do producers adjust?

• Implications for long run and energy efficiency
How do farmers respond to energy prices and energy price shocks?

- Estimated response for different energy price periods and regions, 1961-73, 1974-80, 1981-99
- Energy own price elasticity is inelastic and varies from -0.9 in early and late periods and to -0.5 in middle period
- Energy substitutability for chemical, material, and capital inputs during increasing and decreasing energy prices is small
- Midwest is more homogeneous and has least responsiveness
- 100% energy price shock during increasing energy price period increases production costs by 3% or less in short run
- What happens in the long run?
Indices of Farm Output, Input Use and Productivity in US Agriculture

Total Factor Productivity
Total Input
Total Output

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Information and technology impact on long run energy efficiency

- Continuation of productivity growth
- Substituting information for other inputs
- Substituting technology for fertilizer, pesticides, energy, and pharmaceuticals
- Substituting information for traditional breeding and husbandry
Conclusions

• Producers respond to energy price shocks, in SR by absorbing increased costs

• Substitution opportunities limited in short run but occur in long run through technology and price incentives

• Productivity growth improves energy efficiency

• Thank you!
Energy efficiency and adjusting to energy price shocks

• Energy demand is driven by relative energy prices

• Shares of energy expenses impact the capacity to adjust to price increases

• Timing of real price increases is critical to adjustment capacity in production agriculture

• Agricultural productivity growth enhances energy efficiency and capacity to adjust to energy price shocks
Indices of Farm Output, Input Use and Productivity in US Agriculture

Index (Base 1996)

- Total Factor Productivity
- Total Input
- Total Output


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Energy substitutability and response to energy price shocks

- Energy price response decreased for energy from 1974-80, and increased 1961-73 and 1981-99, and opposite for chemical and material inputs
- Energy own price elasticity varies from -0.9 in early and late period and drops to -0.5 in middle period. Most and cross price elasticities small and several not significant
- 100% energy price shock would increase production costs by 3% with fixed output but much less in other two periods
Response to higher energy prices

- Producers respond to energy price shocks by absorbing modest increase in costs

- Substitution opportunities limited in short run but may occur in long run through technology and real price incentives

- Generally, productivity growth improves energy efficiency
2006: Fertilizer 34%; Diesel 30%; Electricity 22%

Total Energy Used on US Farms in 2002
Total = 1.7 Quadrillion BTUs

- Fertilizers: 28%
- Electricity: 21%
- Diesel: 27%
- Gasoline: 9%
- Pesticides: 6%
- LP Gas: 5%
- Natural Gas: 4%