The Biofuel Boom: How will it shape Rural American Families and Communities?

Presented at Conference on

*Rising Food and Energy Prices: US Policy at a Crossroads*

Oregon State University, Corvallis Oregon

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More details can be found in the paper: “Dissension in the Countryside: Bridging the Rural-Urban Divide with a New Rural Policy” co-authored with Rose Olfert. The paper can be found at my website at Ohio State. The chapter will soon be published as part of an edited volume by the University of Seoul press. Much of this includes background for those who have not thought about place-based policy.

We thank many comments of readers without any attribution including Jill Clark, Christine Gosselin, Robert Greenwood, Maureen Kilkenny, and Darrel Park. We also thank Infrastructure Canada for their support in funding part of this research under a grant entitled: “Mapping the Rural-Urban Interface: Partnerships for Sustainable Infrastructure Development.” We also thank the Canada Rural Revitalization Foundation and the Federation of Canadian Municipalities for their support in this project, in particular Robert Greenwood.
Motivation

- My underlying commitment (passion) is for strong rural American communities that are prosperous and have a high quality of life.
  - But I provide advice as an Economist—we don’t pander and we aren’t cheerleaders.
- What reflects prosperous communities:
  - Job growth is key
  - Good schools in a knowledge economy
  - Clean environment and high quality of life
  - Low poverty and shared prosperity. (normative)
  - Rural development experts are mainly interested in industries as far as they contribute to these goals.
Motivation

• This talk will focus on how biofuels and the broader “Green Economy” will affect the prosperity of rural Americans and their communities.

  – Need to understand what a sustainable green energy economy would look like.

  • To really compete with the fossil-fuel economy, it must compete with fossil-fuels in terms of cost effectiveness.

  • It has to compete with fossil fuels or our standard of living will decline and all Americans will be worse off.
Motivation

• Once we understand the underlying economic fundamentals, we can come up with clear conclusions on numbers of jobs and effectiveness.

• Going forward, I will:
  • Discuss what politicians say
  • Discuss the economics of fossil fuels—and conclude what a healthy green economy means
  • Discuss the structure of rural American economies
  • Discuss ethanol’s impact on rural economies
  • Finally describe how high food prices hit the rural poor.
Pollsters, Politicians, and Rural America

- **Obama’s Rural and Energy Program**
  - Source: [http://my.barackobama.com/page/content/newenergy](http://my.barackobama.com/page/content/newenergy)
  - [http://www.barackobama.com/issues/rural/](http://www.barackobama.com/issues/rural/)
  - “Promote Leadership in Renewable Energy:** Obama and Biden will ensure that our rural areas continue their leadership in the renewable fuels movement. This will *transform* the economy, especially in *rural* America, which is poised to produce and refine more American biofuels and provide more wind power than ever before, and create *millions* of new jobs across the country.” [emphasis added]
  - In the energy section, in his website says:
  - “Create Millions of New Green Jobs
    - Ensure 10 percent of Our Electricity Comes from Renewable Sources by 2012, and 25 percent by 2025.”

Source BEA: 2007 motor vehicles, bodies and trailers, and parts manufacturing employment= 995,700.

Motor vehicle and parts dealers is irrelevant, but that is 2,156,900 for 2007. mostly auto sales people.
Let’s evaluate if a Green Economy and Biofuels can deliver such promises

- Alternative Green energy has tremendous advantages: less carbon, replace fossil fuels, limit dependence on foreign sources. This strikes me as very worthwhile.

- But what do we want, A or B:
  - B. A bloated Soviet Jobs Program aimed to provide goodies to entrenched special interests.
    - Such a program will hurt our competitiveness, not help the environment, and we will eventually have to pull the plug on it — à la Oil Shale of the late 1970s.

No free lunch
Let’s evaluate if a Green Economy and Biofuel can deliver—cont.

- We first need to understand opportunity costs
  - *OC: “what we give up when we make a decision”*
  - So, if “green” energy is expensive, the opportunity cost is that we could have used lower-cost fossil fuels and helped maintain our competitiveness.
    - After we account for net environmental costs.
    - Higher incomes allow us to mitigate the effects of (say) climate change.
  - Why not just subsidize green energy to lower costs for the end user?
    - There are still opportunity costs in the form of higher taxes, less spending on healthcare, infrastructure, education, the military, etc.
    - Higher taxes lower our competitiveness—unless you believe that the tooth fairy and Santa Claus will pay these subsidies.
Fossil Fuels: Coal-based Electricity

- We need an assessment of fossil fuel productivity to grasp what is needed for Green energy.
- Whatever the source, we will have some sort of distribution network. So, I will focus on the base source.
- Montana & Wyoming Coal Mining—why, these are rural areas and I grew up in that region.
  – It makes my main point.
- Then compare this briefly to wind turbines and then ethanol in more detail.
Percentage of US Electricity Generated by Source, 2006

- Coal: 49.0%
- Natural Gas: 20.0%
- Petroleum: 1.6%
- Nuclear: 19.4%
- Hydroelectric Conventional: 7.1%
- Other: 0.2%
- Other gases: 0.4%
- Geothermal Biomass: 0.4%
- Solar/PV: 1.3%
- Wind: 0.7%

Source: Department of Energy, Energy Information Administration.
## Coal's role in the economy.

<table>
<thead>
<tr>
<th></th>
<th>Share of U.S. Coal Production</th>
<th>Approx share of U.S. Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>WY share of US total coal production</td>
<td>38%</td>
<td>19%</td>
</tr>
<tr>
<td>MT share of US total coal production</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source for coal employment is Energy Information Administration, Department of Energy.  

Total US coal production: 1,182,750 (thousand short tons),  

See Appendix table for calculation.
<table>
<thead>
<tr>
<th></th>
<th>Employees in coal 2006</th>
<th>Total State employees 2006</th>
<th>% total that are in coal mining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montana</td>
<td>942</td>
<td>630,288</td>
<td>0.15%</td>
</tr>
<tr>
<td>Wyoming</td>
<td>5,837</td>
<td>375,047</td>
<td>1.56%</td>
</tr>
<tr>
<td>U.S.</td>
<td>82,959</td>
<td>177,815,600</td>
<td>0.05%</td>
</tr>
</tbody>
</table>

*Includes all employees engaged in production, preparation, processing, development, maintenance, repair shop, or yard work at mining operations, including office workers,
Source: Energy Information Administration [http://www.eia.doe.gov](http://www.eia.doe.gov) (including energy production)
Total state and U.S. employment is from the U.S. Bureau of Economic Analysis.
Fossil Fuels vs. Green Energy

• Only, 6,800 coal miners produce coal that supplies 21% of U.S. electricity!
  – A key reason that we are ‘addicted’ to fossil fuels is that we are so remarkably productive at it.
• Green energy needs to be at least ‘nearly’ as productive to be sustainable.
  • We cut it slack if it is ‘clean’—i.e., properly pricing carbon.
  – But, the numbers of jobs should be thought of in the tens of thousands, not the millions.
  – We need a green-energy sector that employs few workers, not one that employs ‘millions’ of workers. The latter is not sustainable.
Sustainable Green Energy needs

• A punch line of this talk is that green energy cannot be nor should it be some sort of a major jobs creator if it is to be sustainable.

• Those who claim otherwise have either not thought through what a 21st Century Green Economy would have to be to be competitive.
  – Or, they are special interests that would benefit or they are letting pollsters set the agenda.

• A national energy policy is not the same as good local economic development policy!
Wind energy

- **Efficient** wind energy is good energy policy, but I am not even sure if *inefficient* wind energy would create large numbers of jobs.
- Why?
- We have had a similar capital-intensive technology—e.g., cell phones. (another good idea)
  - But after the constructions of scores of cell towers, what has been the employment effects of cell towers.
    Well, not much—it's too capital intensive
- Why wouldn’t the same apply for wind turbines if it is capital intensive?
The main component of U.S. RD policy is in the five year farm bill for USDA. USDA RD spending is only 3% of its budget.

Rural America is very diverse
6.5% work in primary-sector farming, compared to 1/3 in 1950
About ¼ of earnings are from manufacturing

Is Farm Policy Rural Policy?—cont.

- A natural-resource based ‘rural’ policy directly affects the same share of the rural economy as a policy aimed at financial services in urban economies.

- Equating natural-resource policy as ‘rural’ policy is akin to equating Security & Exchange Comm. policy or FED banking policy as ‘urban’ policy.
  - My point is not that ‘sector policies’ are ‘bad.’ We need a food or banking policy! It is sector policies are NOT ‘place policies.’
  - Similarly, ‘green’ policies are not analogous to ‘rural’ policy.
<table>
<thead>
<tr>
<th>U.S. Farm Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The overriding theme is recent success</td>
</tr>
<tr>
<td>– Fewer farmers growing amazing amounts of food.</td>
</tr>
<tr>
<td>• Feeding the world at a much lower price.</td>
</tr>
<tr>
<td>– Fewer farms due to consolidation</td>
</tr>
<tr>
<td>– Fewer farm workers and fewer related agri-business workers (related to productivity growth)</td>
</tr>
<tr>
<td>– This has contributed in transforming the old rural economy into the New Rural Economy.</td>
</tr>
</tbody>
</table>
According to BLS household data, only just over 1% of Americans are primarily employed in Agriculture when using a primary job definition.


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What’s happening in the broader agribusiness economy?

• How big is the agri-food economy relative to the rest of the rural American economy?
  • Keep in mind that there were about 148m jobs in metro America and 26m jobs in nonmetro (or ‘rural’) America in 2005.

I will follow the long-held convention that nonmetropolitan defines rural. In the U.S., metro implies a city core of at least 50,000 residents.
US Share of Agricultural Inputs Employment as a Percentage of Total Employment

To illustrate the change in rural America, note that roughly all of Rural America outside of the Northeast and the West Coast was farm dependent in 1950.

That “rural” economy was very influenced by global events such as the boom in commodity prices surrounding WW II and the Korean War.

Sources for this analysis are U.S. Dept. of Agriculture, Economic Research Service, 2007 Farm Bill Theme Papers, Rural Development July 2006.
• In terms of rural development, it is the green counties that would mostly benefit from expanded farming employment. Other rural counties are much more tied to nearby urban areas in an interdependent relationship.

• By 2000, farm dependent counties were mostly limited to the Great Plains. Other remote rural counties that have often struggled include natural resource dependent counties—usually in mining or forestry.

• The rapid increases in productivity in farming and natural resources have put these regions at a disadvantage in terms of employment opportunities (e.g., we need fewer farmers to produce the same amount of food as we did in the 1940s). Farm productivity is good for feeding the world, but has put many rural communities under stress.

• Another problem is the tremendous changes in rural America have gone mostly unrecognized in key circles. Policies are often designed with the 1950 vision of rural America, not the current much more diverse version.

• Sources for this analysis are U.S. Dept. of Agriculture, Economic Research Service, 2007 Farm Bill Theme Papers, Rural Development July 2006.
Non farm Rural Population

• Has the shrinking farm footprint spread to the non-farm rural population?
• No—The share of the U.S. population that is nonfarm rural has remained roughly constant for 150 years (Kilkenny and Johnson, 2007).
• Delivering rural prosperity through farm or biofuel programs (or any other sectoral policy) is misguided. We need place policies to do that.

Thanks to Maureen Kilkenny for the idea about the landscape still agriculture but the people are doing many things.
Rural = nonmetropolitan in this discussion.

Ethanol boom is busting as few new plants are being constructed:

See: “Ethanol Is Dream Deferred for Farming Towns Too Late to Biofuel”


Sept 12, 2008.

Other sources are on the next slide.
Opportunity costs of subsidies, $46 million for a 100 million gallon plant per year?

"Direct employment in the plants is not large, typically averaging about 35 jobs per plant. The 88 nonmetro plants employ about 3,100 workers. Seventy percent of the nonmetro ethanol plants in operation are located in counties that declined in population from 2000 to 2006, whereas just half of all nonmetro counties lost population. Of new ethanol plants under construction, nearly four-fifths (67) are in nonmetro counties and 75 percent of these are in counties with declining population. (In economic development, weigh the opportunity cost of the subsidy vs. other things that could be done in rural America. Is this a net gain?)" From Rural America at a Glance.

Of 26 million jobs, 3,100 nonmetro jobs represents 0.01% of total rural employment.

For more details of how ethanol affects the Iowa economy, see David Swenson, The Economic Impact of Ethanol Production in Iowa is available at: http://ideas.repec.org/p/isu/genres/12865.html

Here is the associated press release: from SSTI, 5015 Pine Creek Drive, Westerville, Ohio 43081
Phone: (614) 901-1690 http://www.ssti.org

Iowa Researcher Finds Limits to the Economic Impact of Ethanol

In recent years, Iowa, like many midwestern states, has experienced a boom in ethanol production. Iowa's natural competitive advantage in growing and processing corn has helped it to move to the forefront of the emerging biofuels industry. The state provides numerous incentives and assistance programs through its Department of Natural Resources to help spur the creation of ethanol-related companies and jobs. A new report by Iowa State University economist David Swenson, however, argues that even if these programs are successful at building a strong ethanol industry, the overall economic impact of this success would be smaller than predicted.

Swenson argues in The Economic Impact of Ethanol Production in Iowa that many projections of the economic impact of corn ethanol suffer from improper input-output modeling and frequently overestimate the number of jobs that could be created by the industry. He found that the ethanol boom that occurred between 2000 and 2005 did not lead to the creation of many construction jobs. Instead, much of that construction work was undertaken by out-of-state firms that brought specialized workers with them.

Once an ethanol plant is finished, it rarely requires many workers. A 50 million-gallons-per-year (MGY) ethanol plant requires only 35 direct workers, while the more intensive 100 MGY plants still only require 46 employees. In addition, the number of full-time employees required for these plants is expected to decline as the technology becomes more advanced.

Some of the other most frequent errors made in modeling the impact of ethanol pointed out by Swenson include:

- Corn Production – Models often include the corn grown for ethanol as a new activity. In most cases, this corn is already being produced. In cases in which new corn would have to be grown, that land would have previously been used to produce other crops.
- Transportation – Many models include new jobs in transportation and trucking, under the assumption that ethanol plants will need new supply lines. Farmers, however, already use trucking companies to move their corn. In fact, by building local ethanol plants, the state may even see a reduction in the demand for transport services.
- Regional Offsets – Other industries that compete for many of the same input resources, such as hog and poultry producers, will have to pay more for resources and services. Also, the cost of corn-based feeds will increase for these industries.

Since corn production is in Iowa – and any other state – is naturally limited by the availability of land and other resources, the number of ethanol plants a state can accommodate is finite. According to Swenson, even if Iowans were able to produce two billion bushels of corn, the state would still only require 55 plants averaging 90 MGY in size. In 2005, the state grew only 400 million bushels. In 2009, 42 ethanol plants will already be operational, and the state appears to be approaching its ceiling for ethanol production and employment.

Swenson does not propose ending state support for the biofuels industry, but he does suggest that some of the state’s justifications for its ethanol programs are based on misleading employment indicators. The overall impact may be smaller than expected in the state, even though Iowa has long been a national leader in biofuels production. For other states, with even less land dedicated to corn production and with less focus on ethanol, the employment impact may be even more limited.
Voting with their feet: Are more people moving in than moving out as economists best signal of whether a place is prospering in terms of economic and quality of life.

I picked a year period where bio-fuels rage was going quite strong. Note in the red ‘circle’ of the greatest intensity of ethanol plants that there is still broader out-migration in rural America—even during the construction phases. Also, this reaffirms that ethanol may be an excellent farm/energy/environmental policy, but it does not substitute for a rural policy.

Note the yellow patterns in the Great Plains and the red/blue growth near urban areas and high amenity areas. Those trends overwhelm other demand shocks.
### Ethanol and local communities

- Good studies are Low and Isserman (forthcoming) and Swensen (2007).
  - E.g., Renewable Fuels Association, Urbanchuk (2008) estimates a 100 MGY ethanol plant will lead to 1,137 jobs in the local economy and 1,790 jobs statewide.

  - They show that industry advocates often overstate job gains by at least 10 fold.
    - Kelly Edmiston (2004) of the FRB-Kansas City shows that manufacturing multipliers are often closer to 0.25.
    - So, the over-estimate is up to 170 fold—i.e., 45 job plant would only create (on net) 10 jobs after the offsetting effects work their way through system.

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Swensen, David. “Understanding Biofuels Economic Impact Claims.” Iowa State University, Department of Economics, April, 2007.


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Other factors for ethanol

- New corn production overestimated
- New transport jobs are overestimated
- Other regional offsets from higher input costs though there could be feeder lots
  - Source: Swenson (2007)
- Water treatment also varies considerably in cost and availability. High taxes causes local job losses.
  - A large, 100 MGY plant consumes the amount of water used by a community of 15,000 people.
    - Source: Low and Isserman (forthcoming)
- There could be noise, dust, and transport infrastructure costs.
Amenity driven growth is very powerful. For perspective, I picked places that we have heard of though not rural. Also to avoid the small base problem of a county of 100 people that added 100 people doubled in population—who cares.

Between 2001-06, metropolitan Calgary grew 13.4%; but metro Las Vegas grew 22% to almost 1.8 million; metro Phoenix grew 19.3% during the period to over 4 million people. But LV and Phoenix have been doing this for decades.

Regarding metro adjacent settings, metropolitan Wood Buffalo (Ft McMurray) 2001-06 grew 23.6%/ exurban Delaware County outside of Columbus, in slow growing Ohio grew 31.4% during the period to nearly 157,000 people.

What would good rural policy do?

- Recognize the 3 rural Americas to design policy
- Knowledge and education—rural creative class.
- Good quality of life leveraging regional assets
- Build from within by enhancing local entrepreneurship and small businesses
- Incorporate regional governance to capture strong rural-urban connections
  - Tax sharing, shared service delivery, econ. develop.
  - Regional infrastructure: roads, broadband.
    - The current Farm Bill **only** gives equal to regional funding as one 100-mg Ethanol plant receives over 3yrs.
## Food-Fuel and Rural America

- A reasonable estimate is that 20% of additional cost of food inflation is due to biofuels (Parker, 2008).

- In 2006, a family earning <$30K spent 15% on food vs. 11% for a family earning >$70K.
  

- The poor and Rural America are bearing a somewhat higher cost of biofuel mandates because of lower incomes.
  
    
  - noncore rural: **$37,844** [source: 2007, ACS.]
  
  - 2007 Poverty rates: MAs: **12.4%**, Micros: **15.4%**
    
  - noncore rural: **16.6%** [source: 2007, ACS.]

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The American Community Survey, data on poverty and income can be found on the U.S. Census Webpage: *Income, Earnings, and Poverty*

*Data From the 2007 American Community Survey, August 2008,*

2-4% of HH income is spent on gas in metro counties vs. 6-16% in most nonmetro counties. See the map in the appendix.

Conclusions

- My underlying goal is a commitment for prosperous rural American communities and green energy that is sustainable in the 21st Century.
- Others appear to view Green Energy as a “Soviet Jobs Program” with goodies for special interests.
- Fossil fuels are very efficient—not a jobs program.
- To be competitive and sustainable, green energy can’t employ large numbers of workers.
- **A punch line is that green energy cannot be nor should it be some sort of a major jobs creator if it is to be sustainable.**
Conclusion

• Wind energy and ethanol are also unlikely to be large job creators even in local communities.

• **The problem for rural America is that green energy distracts us from what really needs to be done to ensure a prosperous future for rural America**

  • I have argued that they’re bad rural policy because: we don’t “**distinguish the landscape from what the people actually do!**”
  

  • The bucolic landscape may look agricultural or forested, etc, but the people are usually working on other things.

  — I believe this confusion underlies why many believe overstated claims regarding green energy. Yet, rural America is pays high-cost and it has gone unnoticed.
To conclude, I want to reaffirm what a pleasure it has been here today. I hope this presentation has stimulated you, not only for the remainder of this workshop, but also to go back and to your communities and try new innovative solutions.
Appendix Slides
## Source for electricity generated in from MT/WY coal.

### Coal Production 2006 (Thousand Short Tons)

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of Mines</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
<td>21</td>
<td>446,742</td>
</tr>
<tr>
<td>Montana</td>
<td>6</td>
<td>41,823</td>
</tr>
<tr>
<td>US. Total</td>
<td>1,438</td>
<td>1,162,750</td>
</tr>
</tbody>
</table>

- WY share of US total coal production: 0.38
- MT share of US total coal production: 0.04

<table>
<thead>
<tr>
<th>Source</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>US residential consumers of electricity, 2006</td>
<td>122,471,071</td>
</tr>
<tr>
<td># of residential consumers powered by WY coal</td>
<td>23,433,291</td>
</tr>
<tr>
<td># of residential consumers powered by MT coal</td>
<td>2,193,773</td>
</tr>
</tbody>
</table>

Source: Energy Information Administration [http://www.eia.doe.gov](http://www.eia.doe.gov)

• A large, 100 MGY plant consumes the amount of water used by a community of 15,000.

• To ensure year-round supply, most plants pay a small per bushel price premium over local elevator prices, commonly 5 to 10 cents per bushel (Schill, 2007; Swenson, 2008).

• This price premium compensates producers to truck corn as far as 50 miles to the ethanol plant (Stuefen, 2005).
• 45% of Iowa farmland owners do not live on the land and 19% of Iowa farmland is owned by people living out-of-state

• In IMPLAN modeling language, the event being modeled is an increase in ethanol output within the county, an increase in farmland owners’ income, an increase in corn acres, and an increase in livestock production.

• In the four case studies, there are 35 to 39 jobs at the plant and 99 to 250 after all the indirect and induced effects in the county are included.

• Increases in cattle operations, where feasible, could have large effects, but the effects depend on the technology to be used, its integration with the local economy, and its labor intensiveness.

• In a report for the Renewable Fuels Association, Urbanchuk (2008) estimates a 100 MGY ethanol plant will lead to 1,137 jobs in the local economy and 1,790 jobs statewide.
• Additional land brought into corn production in regions where corn is irrigated, as in Nebraska, might lead to thousands of acres of new irrigation unless water use is restricted. Overpumping can eventually exhaust aquifers and lead to irrigated farmland returning to dry land production, causing land values to fall – 30% to 60% in one estimate.

• Water treatment also varies considerably in cost and availability. Often, the treatment infrastructure is provided by the municipality or another local government with costs borne by the community or shared with the plant.
• Based on interviews with industry professionals, Swenson (2007) takes another 1,943 jobs away from Urbanchuk’s Iowa total because the utilities do not add jobs proportionately to their output increases. Swenson chips away further: 1,081 jobs stemming from transportation because the corn would have been transported to export without the ethanol plant and 351 jobs from petroleum refining unlikely to occur in Iowa. In the end, changing the assumptions reduced the estimated Iowa job impact from 27,205 to 5,431.

• An ethanol plant offers the same enticing benefits to the local economy as any manufacturing plant that employs 30 to 50 people and pays good wages.
• **Understanding Biofuels Economic Impact Claims**, David Swenson, Iowa State University, Department of Economics, April, 2007.

• A 50 million gallon per year (MGY) ethanol plant in Iowa requires 35 jobs. A 100 MGY per year plant only requires 45 jobs.

• Construction of ethanol plants typically increases both truck traffic for feedstock inputs and train traffic to deliver the finished product to market in the communities where they locate.