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## Estimating the Job Impact of Public Investment in Bio-fuel Plants\*

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### What is the Issue?

There is a great deal of excitement about the green economy, clean technology, and the potential creation of “green jobs”. However, the methods used to project job creation from investments in renewable energy and energy efficiency are not well understood. Since these employment projections are used to legitimize public investment in “clean tech” firms via tax incentives, state and local economic developers need to know how to assess their reliability. In this policy brief, we examine 16 studies of the economic impact of ethanol plants and this “green” industry’s prospects for job creation.

### The Where and Why of Ethanol Plants

Corn remains the most prominent source for ethanol production. The big corn producing states are well positioned to take the lead in ethanol production because of concentrated ownership, very large farms, and storage and processing facilities. These attributes make ethanol production an economically rational “add-on” to other corn production activities.<sup>1</sup> Ethanol processing plants are popular investments in the major Midwestern corn-producing regions, not only because ethanol provides another market for corn, but because the processing plants are tied to the resources and local advantages of individual communities (<http://www.ethanolrfa.org/industry/locations/>).



While most job creation from ethanol processing occurs in the plants themselves, ethanol production creates jobs throughout the regional economy: on farms; in the transport of corn and processed ethanol to and from processing facilities; in the utility companies that provide electricity, natural gas, and water; in the cattle operations that utilize the spent grain for feed; and in the construction of the facilities and infrastructure needed for plant operation.<sup>2</sup> In addition to these new jobs, indirect or “induced” jobs are created in services such as banking, accounting, manufacturing, chemical production, retail, etc.<sup>3</sup>

While economic development officials may be interested in the ethanol plants’ job creation potential, investors are more interested in the potential for profit. Government subsidies for the facilities are almost always required to assure private sector profits while regulatory initiatives

are sought to create a market to increase bio-fuel consumption. Economic impact studies of ethanol plants help justify government policy to create bio-fuel markets and government investment in facilities resulting in profits for private firms (such as Archer Daniels Midland, the largest producer of ethanol in the U.S.).<sup>4</sup>

### How are economic impacts projected?

The sixteen studies we analyzed included both independent assessments and those conducted by organizations with a financial interest in promoting government subsidies. Studies sponsored by organizations that have a stake in the industry are not necessarily independent since sponsors have a significant interest in positively influencing the projected economic impacts. The studies we reviewed are based on different assumptions and use different methods, though most rely on input-output models to project job and tax impacts. The majority of input-output models in the studies we examined use federal, county and zip code data compiled by IMPLAN (an acronym for Impact Analysis for Planning), a private firm that specializes in input-output data and modeling. Because IMPLAN models and data are adaptable and relatively inexpensive, they are widely used in economic impact analysis.

Input-Output models are accounting frameworks that show how output for each and every regional industry is affected by a one-dollar change in final demand.<sup>5</sup> If money comes into the regional economy to build new roads or a new ethanol plant, the expenditures connected to that investment ripple through the economy, also known as a “multiplier” effect. However, while the standard accounting framework works well for many industries, it is problematic for assessing ethanol’s impact. One reason for this is that dry milling is the most prominent process in ethanol processing and that industrial category is not represented in the IMPLAN model. Accordingly, economic impact analyses of ethanol plants typically use the industrial sector of wet-milling to account for inputs into ethanol processing. While these two industries are similar in many respects, there are critical differences<sup>6</sup> that lead to problems estimating inputs into the industry and in the ultimate reliability of the multipliers produced. This example shows that the models used to project the job impacts of ethanol plants are affected by many individual decisions about which data are used and how they are interpreted.

Another important limitation of input-output models is that they use *estimated* data. None of the studies we examined used real world data to evaluate projections. Even when looking at existing ethanol plants, evaluators used input-output models to estimate job gains rather than looking at actual job change numbers. In order to determine the accuracy of model-based ex ante estimates, we need studies of the actual job impact of ethanol plants. In the absence of studies looking at actual jobs created, policy makers and citizens need to understand that the numbers produced in impact studies are only projections. They are not guaranteed and often are highly sensitive to factors beyond the control of the ethanol plant operators.



## How and why estimated impacts can differ

Given that these impact analyses are based on models, some differences among the results are attributable to the way the input-output analyses are constructed and the assumptions used to construct the analysis. For example:

- IMPLAN has to be adjusted to create a dry-mill ethanol industry sector. The way these adjustments are made affects how many jobs are projected for different inputs into the process.
- Construction costs and jobs are sometimes included and sometimes excluded from operating projections.<sup>7</sup>
- Corn being grown for the ethanol plant is sometimes considered a new input into the model although it was already being grown for other markets (feed and food).<sup>8</sup>
- New utility jobs associated with the consumption of natural gas, water, and electricity used in ethanol production are often over-estimated because: "All three of these...are massive, declining cost industries where the average cost of delivering their respective commodities up to capacity is declining sharply."<sup>9</sup>
- Transportation jobs are often over-estimated, especially in corn-belt states, because corn is already being hauled from farms to mills, or to livestock feeders or out of state. With ethanol production, the infrastructure and jobs that are already present would simply switch to ethanol transportation with small if any increases in employment.<sup>10</sup>
- Results can differ dramatically depending on how the model calculates the location of expenditures - whether key inputs are purchased locally or imported into the region. If inputs are imported, then local expenditures and their ripple effect on the local economy are lost to the region.
- The opportunity costs of growing corn rather than other crops or of using land for other purposes are rarely assessed in economic impact models.

An important consideration for policy makers is whether the *assumptions* are clear and available for evaluation. Without that information, public officials or interested citizens cannot assess whether the economic impact model is reasonable. Almost half of the studies examined did not discuss the assumptions made by the researchers. While this does not mean that the studies produced invalid or unrealistic projections, it means that the projections are difficult to evaluate. For example, if public officials examined the sixteen studies we analyzed, they would find that projected job multipliers differed significantly, ranging from a high of 73,<sup>11</sup> to a low of 2.8.<sup>12</sup> While some differences in projected job multipliers may be attributable to plant and expenditure location, such a wide range indicates that not all the projections are reliable. Among the studies evaluated, the most reliable seemed to set a job multiplier in a range from 2 to 7. A job multiplier of 2 is more likely in rural areas where there are fewer goods

and services (including inputs to the ethanol processing plant) that can be purchased locally. A multiplier around 7 is more likely if the plant is located near a metropolitan area where more inputs can be purchased locally and where there is potential for greater recirculation of dollars spent in connection with the plant.

## Information to Consider When Determining Whether to Subsidize the Production of Ethanol

- **Local variation:** The impact of an ethanol plant on a local economy depends on a wide array of local and regional factors that are often overlooked in impact studies. The number of jobs that a given facility creates depends on the size of the plant, the complexity of the local economy, what goods and services are available locally, and how much income is generated locally by the corn price premium provided by the facility.<sup>13</sup>
- **Political motivation:** Political motivation may often determine results or affect interpretation of results. And, while the executive summary of a report may emphasize the positive, those interpretations are not always justified in the more detailed study findings. Policy makers need to take political interests and economic motives into consideration when evaluating study results, and these motives are not always apparent.
- **Property ownership and existing infrastructure:** Ownership patterns and how farmers make money are critical elements which determine whether a bio-fuel plant investment is economically feasible. Farmers will not participate in a bio-fuels program unless it has money-making potential. This includes the long-term and short-term costs of changing what they are doing to grow a bio-fuel crop. Large corn farmers in the Midwest grow corn as their primary commodity crop. Bio-fuel provides them with another market for their product and has the potential to raise prices. In eastern States, such as NYS, where farms are smaller and many farmers are engaged in high value-added crop production, such as organic food, bio-fuel production may not be efficient. Economic developers need to consider the comparative advantages of their own agricultural sector rather than basing decisions conducted in regions where the structure of agriculture is significantly different.
- **Return on Investment:** If public investment is required, economic developers and public officials need to assess whether the investment is likely to pay off for the tax payers. Could tax revenues be used in a more effective way? What are the opportunity costs of subsidizing ethanol production? For example, investment in marketing and distribution for farmers engaged in high value added food crop production may have a better long-term economic impact than investment in an ethanol plant.

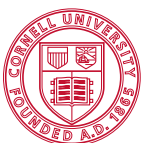
## Conclusions

Economic impact analyses should never be accepted at face value to justify public investments. Officials engaged in making decisions about public investment in ethanol production should base their decisions on a deeper understanding of the inputs, methods and assumptions used in producing job projections and other ethanol related impacts. Experts on impact analysis exist on most college campuses and, in many states, in cooperative extension offices. These experts can provide assistance in understanding impact analyses and whether and how to use the results as a guide for policy. ▲

### Notes:

\* The 16 studies examined and other references cited in footnotes are available on the CaRDI website along with this publication.

A working paper on this topic has been archived in eCommons@Cornell, and can be accessed at: <http://hdl.handle.net/1813/14219>.



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