I. Planning for Advanced Biofuels Job Growth Expectations

Dave Swenson
Iowa State University

Biofuels Job Growth Has Consistently Been Over-Stated

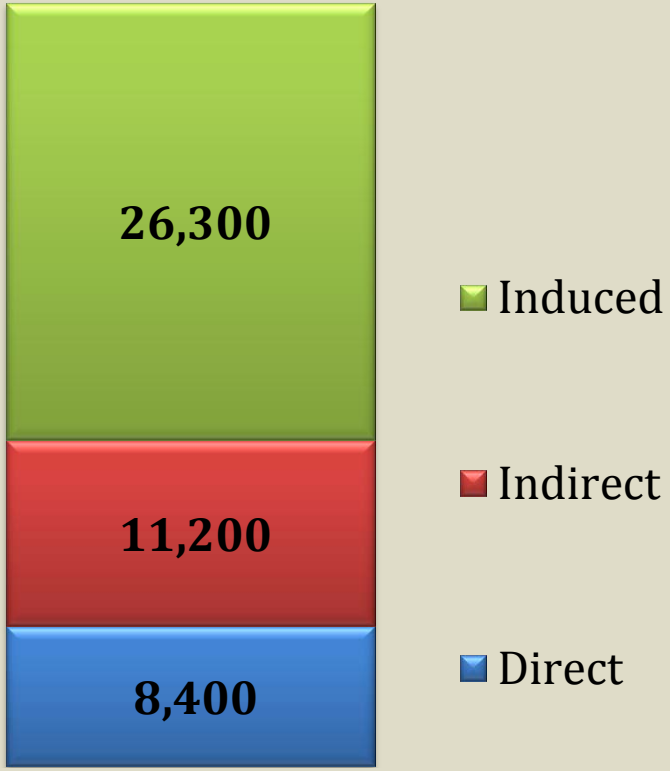
As a few examples…

- In a 2006 essay. former U.S. Senator Tom Daschle declared there were **200,000 jobs** associated with the production of 3.1 billion gallons of ethanol that year. We are now producing over 12.0 billion gallons of ethanol – would we multiply that estimate by 4 to get 800,000 jobs?
- In a recent report, Urbanchuck (2011)said there were **400,677** ethanol-related jobs in 2010 in the U.S., and
- USDA Secretary Tom Vilsack cited that amount in testimony before a Senate subcommittee in April, 2011, claiming some **400,000** U.S. jobs were at risk were ethanol subsidies reduced or eliminated.

In Contrast …

Our work (2009,2011), using generous production linkage assumptions, says that there would be an estimated **45,900** net new jobs in the U.S. associated with producing about 14 billion gallons of corn ethanol a year.

National Ethanol Job Impacts at 13.5 to 14.0 BGY



These are the major problems with many ethanol job declarations

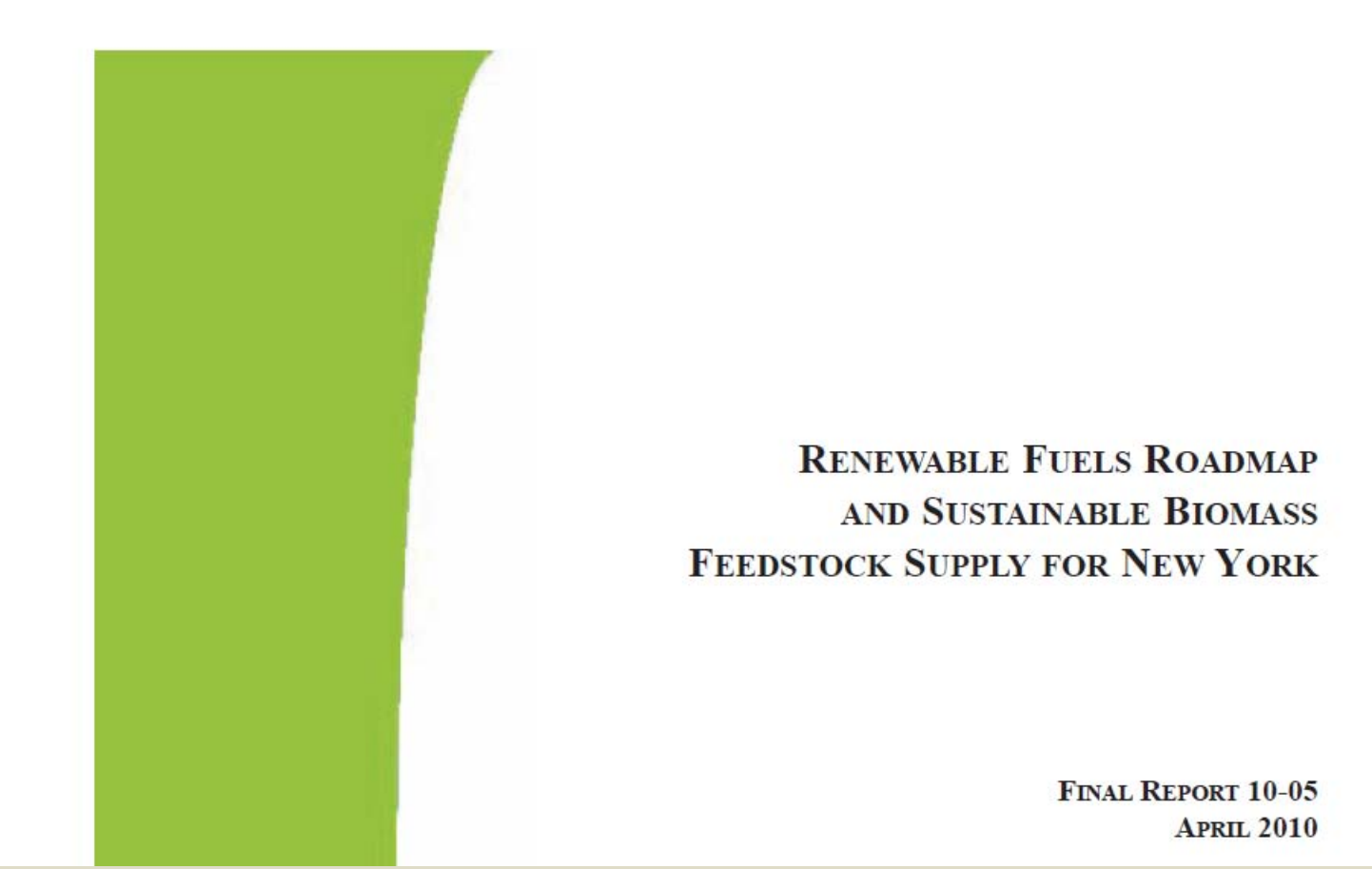
First and foremost, in many instances either inappropriate, uninformed, or even misleading applications of input-output modeling methods, coupled with uncritical evaluations of those efforts by both state and federal government agencies and as well as university economists:

- Frequently modeled and reported as if ethanol plants were creating more corn farmers and corn crop acres rather than primarily consuming what already existed
- Over-described short-term construction activity and treated it as if it (or a large fraction of it) was perpetual
- Paid little or no attention to the economic consequences of shifts and offsets to existing users of corn (or the previous users of crops on cropland converted to corn production)
- Sloppy vernacular – the economic impacts should describe net new productivity added to the U.S. economy, and that calculus begins at the point at which we began to add value to the already existing corn

We Are Doing the Same Thing With Our Advanced Biofuels Expectations

- For example, Bio-Era (2009) anticipated advanced biofuels total job impacts would be ….
  - 123,000 in 2012 @ 2 BGY
  - 383,000 in 2016 @ 7.25 BGY
  - 807,000 by 2022 @ 21 BGY
- Those expectations were driven by EISA of 2007, but EPA has since significantly reduced advanced biofuel expectations as advanced ethanol production levels have remained disappointingly (if not embarrassingly) low
  - Advanced ethanol is now limited to 6.6 MILLION gallons in 2011 (down from 250 MGY) and perhaps as much as 12.9 MILLION gallons in 2012 (down from 500 MGY).
  - However, we have recent announcements that as much as 50 MGY of cellulosic ethanol production capacity will come on line sometime in 2013 or 2014 in Iowa!
- We have our job gain expectations way ahead of production reality, and again, our expectations are nonetheless much too robust

What About the Future? Using the NY Renewable Fuels Roadmap as a Template for Future Job Estimates



Dave Swenson -- Department of Economics -- Iowa State University

Collaborative Approach to Impact Modeling for Estimating Advanced Biofuels Growth

- ✓ Commercial and governmental IO modeling systems do not contain advanced biofuels sectors, so there are no convenient, off-the-shelf multipliers to be applied (or misapplied)
- ✓ Relied on NREL-JEDI direct technical coefficients
- ✓ Relied on independent and multi-university based research on biomass yields, transport requirements, and the rational siting of plants
- ✓ Modified existing, research-based biomass harvesting research so that it assumed larger, more efficient systems.
- ✓ Necessitated a detailed table of inputs approach to modeling.
- ✓ Identified net new NY productivity associated with feedstock production, transportation and storage, and refinery operations.
- ✓ Unlike corn ethanol, we get significant net new up-stream, land based productivity gains – in fact the preponderance of net job gains would be due to biomass harvesting and transport.

Ratcheting this upward

- In the NY study, we found that 3,891 jobs would be required to produce 354 million gallons of cellulosic ethyl-alcohol.
- The current advanced ethanol mandate calls for 4.25 billion gallons by 2016.
- So ….
  - 4.25 billion U.S. gals ÷ 354 million NY gals = **12 NYs**
  - 12 NYs X 3,891 jobs = 46,692 jobs
  - Stated differently, and as a rule of thumb multiplier, we would expect, using state level multipliers, 10,986 jobs per billion gallons of advanced ethanol.
  - That would multiply to **175,781** jobs were we to produce 16 BGY of advanced ethanol by 2022.

The Lessons and "Oughts"

1. This is very knowable stuff, not black-box voodoo – we can do this well, and policymakers ought to be demanding well-done and defensible estimates of job creation – especially in the current economic climate
2. Rigorous, independent, and peer reviewed research ought to be guiding policy choices, not industry-supplied assertions
3. Land grant universities have been remiss in many of these areas – they ought to remedy that

II. Understanding Expected Job Gains from Biofuels Production and the Implications for Workforce Development

Dave Swenson
Iowa State University

At the regional level: Corn based ethanol in Iowa

At the plant:

- A 100 MGY ethanol plant needs 45 to 50 workers
  - About 15 of those jobs require college degrees (engineer, chemist, management, accounting, and marketing).
  - About 15 of those jobs require advanced technical training (community college, mostly, as plant process technicians, electricians, and mechanics)
  - The remainder will be a mix of grain, byproduct, and ethanol handling, site maintenance, office help, and facility upkeep jobs

At the statewide level

Assuming about 1,600 workers at the plants

- 500 college educated professionals
- 500 technically trained professionals
- 600 or so other workers

Midwestern universities adequately supplied chemists, engineers, and other professionals. There was also an existing pool of grain origination and marketing professionals that shifted from elevator operations into employment or partnerships with the plants

Iowa community colleges already had ag / biofuels processing and technician programs in place and coordinated their curriculum with the pace of plant development, and

Rural areas possessed significant grain handling and generally skilled labor slack to accommodate the remainder of the job demand

Estimating the indirect job growth is, however, more difficult

- As the multiplier charts demonstrated, the systems expect more indirect job creation than direct job creation.
  - Some of the more technical of those jobs include electricians, steam and pipefitters, and a range of mechanical contractors
  - The plants also require a fair amount of legal, accounting, financial, and engineering inputs.

It is our sense that Iowa's existing industrial markets adequately accommodated those incremental indirect job demands without the explicit assistance of the state's higher education structure.

The job requirement needs for advanced ethanol systems are different

- The vast majority of the job growth will be associated with up-stream production
  - Crop and forest harvesting, pre-processing, and transport
  - These harvesting and pre-processing activities will involve technical and logistical scales and scopes that are different than conventional systems and capacities
  - Before workforce needs can be well defined, the systems of production must be well defined

Itemized Direct and Secondary Job Impacts – New York
(354 Million Gallons of Ethanol Per Year)

Statewide Secondary Job Impacts By Industrial Sector	Reasonable Expectations Scenario
Crop based	**656**
Forest based	**1,019**
Transport in	**886**
Transport out	26
Materials & Machinery	26
Business Services	26
Insurance	82
Waste Disposal	110
Water	27
Enzymes	58
Chemicals	55
Financing	369
Subtotal all Secondary Jobs	***3,341***
Direct Jobs at the Refineries	**275**
All Induced Jobs Due to Direct Worker and Investor Spending	276
Total Jobs	**3,891**

NY State Training Conclusions

- There will be significant job creation but the training requirements can likely be met through existing programs
- Expansion of "upstream" jobs in agriculture and forestry may require recruitment and retention programs since these sectors are currently losing workers. In addition new skills related to agricultural and forestry practice and technology at the scales of production anticipated for efficient future systems will need to be addressed
- Planning is required to define the specialized training needs required to provide a productive labor force for "second generation" biofuel plant technology.
- Collaboration of universities, community colleges, and state labor market planners will be necessary to adequately define and deploy advanced biofuels labor in a timely and efficient manner.

What do we take away?

- The likely pace of advanced fuels production growth will probably not tax existing training institutions in the medium term.
- There is much uncertainty as to the scale and scope of production, the likely locations, and final labor and technical needs.
- There will be significant innovation and technical development in the interim, and like all industries, this one will endeavor to substitute technology and capital for labor wherever possible.
- There is an evolving capacity to adequately project job impacts at the regional and statewide levels. That is the level of planning that is most pertinent to education and training policy development, subsidies, and programming, and that is the level at which projection studies ought to be carried out.