

**Additional Audience Questions for Novozymes
2008 Emerging Issues Forum**

North Carolina's Energy Futures: Realizing a State of Opportunity

The following question was submitted by audience members for Thomas Nagy but was not asked because time did not permit. We forwarded it to Novozymes for additional comments.

**1. How do you de-couple economic growth from natural resources?
Also, please address recent studies showing that cropland-based biofuels produce more greenhouse gases than petroleum, when variables such as deforestation are considered.**

A lot has been made over last week's press releases concerning the potential environmental impacts of biofuels. Based on the news reports, it seems these studies were based on some very narrow - and in some cases unfounded - assumptions. There have been multiple rebuttals, but these seldom get as many column inches as the more provocative text. Below is information from an industry group that references the renewable fuel industry's position.

The other part of the question related to de-coupling economic growth from the use of natural resources. The most obvious and least costly method would be through improved efficiencies. If you can produce the same output with less energy or raw materials, then economic growth is no longer tied 1:1 with current consumption levels. From Novozymes' perspective, the use of biotechnology can have a similar positive effect. Many of our processes and applications result in solutions that allow our industrial partners to maintain current production levels while either using fewer inputs or decreasing waste and byproducts. Production is maintained, economic growth (profitability) is increased, and raw material consumption is decreased - thereby de-coupling the current use ratio.



Ethanol FYI

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Scientists Raise Doubts About Recent Studies on Biofuels and Global Warming

Washington –Following the release of two narrowlycrafted reports seeking to demonstrate worst case scenarios with respect to the impact of biofuels production on global warming, scientists from the Department of Energy’s (DOE) Argonne National Laboratory and others from several universities around the country are calling into question the assumptions and conclusions of the researchers who published their findings last week in *Science*.¹

Dr. Michael Wang of Argonne’s Transportation Technology R&D Center and Zia Haq of the DOE’s Office of Biomass Program today sent a letter commenting on those reports. In a response posted on Argonne’s website, Wang and Haq note:

“There has also been no indication that U.S. corn ethanol production has so far caused indirect land use changes in other countries because U.S. corn exports have been maintained at about 2 billion bushels a year and because U.S. DGS exports have steadily increased in the past ten years.”

Wang and Haq conclude:

“While scientific assessment of land use change issues is urgently needed in order to design policies that prevent unintended consequences from biofuel production, conclusions regarding the GHG emissions effects of biofuels based on speculative, limited land use change modeling may misguide biofuel policy development.”

The complete letter questioning the assumptions and conclusions of the reports can be found at:

http://www.transportation.anl.gov/media_center/news_stories/20080214_response.html

Wang and Haq are not the only ones in the scientific community questioning the reports. Dr. Lou Honary, Director of the National AgBased Lubricants Center at the University of Northern Iowa, notes in a letter to the editor of the New York Times:

¹ “Fargione, J., J. Hill, D. Tilman, S. Polasky, and P. Hawthorne, 2008, "Land Cleaning and Biofuel Carbon Debt,"

Scienceexpress, available at www.scienceexpress.org, Feb. 7.

Searchinger, T., R. Heimlich, R.A. Houghton, F. Dong, A. Elobeid, J. Fabiosa, S. Tokgoz, D. Hayes, and T.H. Yu, 2008,

"Use of U.S. Croplands for Biofuels Increases Greenhouse Gases through Emissions from Land Use Change," Scienceexpress, available at www.scienceexpress.org, Feb. 7.

“In technology forecasting, some predictions can be self-defeating just as others can become self-fulfilling. In this case, both reports and their projections of a pending global disaster due to inappropriate land use are overly simplistic and do not take into account many other related factors. The assumption that corn and soybeans are and will continue to be the long term source of raw materials for biofuels production is incorrect, and it is this assumption that leads us to make self-defeating projections.

Dr. Honary concludes:

“Unfortunately, scientific papers, such as those reported by Rosenthal, are based on incomplete information and create misconceptions.

“The fact is that biofuels are part of our energy mix of the future, and while producing biofuels with commodity crops is expensive and less desirable, research will lead to biofuel production that is more economical and even more successful as new crops and new processes are commercialized.”

Joining Dr. Honary in his caution about putting too much credibility in the conclusions of the reports is Dr. Bruce Dale. Dr. Dale is the Chairman of the Department of Chemical Engineering and Materials Science at Michigan State University.

In his critique, Dr. Dale points out that this is a complex issue and not a false choice between the biofuels we have today and some utopian fuel of the future:

“Also, biofuels must be compared with appropriate alternatives. The choice is not between biofuels and some perfect, imaginary fuel. We are going to provide fuels for our vehicles, whether those fuels come from biomass, tar sands, coal, oil shale or some other source. I believe there are strong reasons to question the assumptions, data and comparisons made in these two papers.”

In an interview with Cleantech.com (<http://media.cleantech.com/2427/biofuelindustriescallstudiesnaivenatureconservancyprinceton>), Chris Somerville, director of the Bpfunded Energy Biosciences Institute at the University of California, Berkeley, strongly questioned the findings of the reports. Quoting from the Cleantech.com article:

“Somerville said one of the papers’ fundamental claims, that using land for biofuels will inevitably lead to the expansion of agriculture, doesn’t have a historical precedent.”

“In the case of cereals, over the last 50 years there’s been a doubling of demand, but there’s not been an expansion of acreage,’ he said to Cleantech.com.”

“Expanding demand has generally not led to a corresponding increase in demand for land use. I would say it’s a speculative response for a speculative paper.”

Also raising concerns about the validity of the study, David Morris of the Institute for Local SelfReliance issued a statement outlining what he views to be some contradictory conclusions:

The studies usefully estimate how much carbon will be released when new land is brought into crop production,” says David Morris, ILSR’s Vice President and author of Ethanol and Land Use Changes. “But the authors’ declarations that ethanol increases

greenhouse gas emissions, a conclusion that has made headlines around the world, is not supported, and may be contradicted, by their own data.”

The report notes that the vast majority of today’s ethanol production comes from corn cultivated on land that has been in corn production for generations. “Since little new land has come into production, either directly or indirectly, the current use of ethanol clearly reduces greenhouse gas emissions,” says Morris, who served six years on an Advisory Committee on biomass to the U.S. Departments of Energy and Agriculture.

Mr. Morris’s full comments are available at www.newrules.org.

In the rush to condemn biofuels, many have chosen to overlook the clear flaws in the assumptions and conclusions of the two reports published in *Science*. Public policy in the United States and elsewhere around the globe must take land use changes into account as we seek to continue feeding and fueling a rapidly growing population. Such policy, however, must be based on sound science and not speculative reports that project worst case scenarios.

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