An Economists View on the Bioeconomy – Summary
BERKELEY BIOECONOMY CONFERENCE
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Panel Topic: The State of the Bioeconomy – "An Economists View on the Bioeconomy."

Conference / Location: Berkeley Bioeconomy Conference, March 27-28, 2013, University of California, Berkeley, CA.

Session Topic Description: This discussion talked about the role of technology in the bioeconomy; defining renewable resources; the evolution of harvesting and farming systems; the challenges of the bioeconomy; biofuels; and agriculture and the bioeconomy.

Moderator & Panelists: David Zilberman, PhD Agricultural and Resource Economics Department, University of California, Berkeley.

Design, Methodology, Approach: Presentation with Q&A discussion following.

Main Discussion Points: The traditional bioeconomy relied to a large extent on fermentation, but the modern bioeconomy utilizes developments in molecular biology that will yield products that are renewable. The bioeconomy is defined as the part of the economy that utilizes new biological knowledge for commercial and other purposes. The bioeconomy has led to major changes recently including replacing finite resources with renewable resources, providing new agri-business opportunities, creating rural employment in processing and production of new applications, increasing the value of natural resource and agriculture income, reducing GHG emissions, and accelerating the adaptation to climate change by creating new crop systems in response to varying conditions.

Zilberman talked about the importance of moving to a renewable system and some of the advantages of renewables over non-renewables. Renewables can be stabilized while non-renewables are finite whose extraction leads to stock reduction. Many non-renewable stocks are unknown, and as long as discovery continues, the known stocks increase. The decline of the known stock starts to occur when extraction of non-renewables is larger than the discovery rate.

Some renewable resources are harvested while others are farmed. Harvested resources require less effort while farmed resources require the cost of breeding and raising crops. However, farming systems produce more output. The evolution of farming systems consisted of improving pest control, selective breeding, and better breeding through biotechnology. Farming systems resulted in changes in the species that are consumed by humans. The modern cow is much more productive and less mobile that the traditional cow. Species will evolve with improved farming technologies in the future.

Some of the factors that are contributing to the evolution of farming systems include population and income growth driving increased demand for harvested products, improvements in harvesting technology that will increase supply as more product is needed, technological changes

in breeding and protection, the decreasing marginal cost of farming as it becomes more profitable, and improvements in agricultural productivity leading to an expansion of farming. The transition from harvesting to farming is gradual and will require improvements in the husbandry system with better breeding and raising. New value-added industries will need to be developed as well, but there is great potential to increase agricultural productivity with existing technology, and new technology suggests even greater potential for land utilization while preserving the environment.

Some of the challenges Zilberman outlined are the bioeconomy relies on inputs from non-renewables (like fertilizers) even though the outputs are renewables. Externalities like GHG emissions need to be factored into all stages of production. And bioeconomy activities for industrial products can potentially allocate land away—along with other resources—from food production, which is the "food versus fuel" concern. So agricultural productivity will need to be vastly improved and we may be able to farm in areas that haven't been farmed before. Waste will need to be reduced and agricultural efficiency will need to increase for the bioeconomy to become more viable. Much land can be added for agriculture without having a negative environmental impact. In Brazil, for example, massive lands are underutilized, and the same is true with Africa and Eastern Europe. But the productivity of agriculture has already made great strides with GMOs that took advantage of new developments in molecular biology. The GMOs have contributed to increased output of corn and soybeans but, because of regulation, they are under utilized.

One of the advantages of GMOs is that it allows double cropping, which can significantly increase output, reduce soil erosion, and reduce waste. It is effectively done in Brazil and Argentina, leading to the global increase in the production of soybeans. Currently, in the U.S., only 10 percent of farming uses the technique, but the U.S. has the potential to increase double cropping to 30 to 50 percent of farming.

Zilberman then transitioned to talk about biofuels, saying they are a "work in progress." He went on to say that corn and sugarcane ethanol are economically viable and corn ethanol contributes to the balance of trade, energy security, farm income, but also higher food prices.

Outcomes & Analysis: The transition to the bioeconomy is going to require further research and development to create more effective products. One key element is regulation; the tough regulation of GMOs in Europe in the 1990s have contributed to the reduction of innovation. So there needs to be reasonable regulation. But also safety is important and must be factored in.

Agriculture will become more than just food production. We will need to keep food affordable while moving to a new, renewable economy. In terms of productivity, levels are now very low compared to what is possible, and scaling is critical to meet growing energy demand. Double cropping and the spread of new technology worldwide will be key to the growth of the bioeconomy. The development of the bioeconomy will be also be impacted by weather and diseases, so adjustments will necessary.

Keywords: Biofuel, bioeconomy, renewable resources, nonrenewable resources, biotechnology, double cropping, harvesting technology, agricultural productivity, agricultural efficiency.

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