Summary

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What have we learned?

- Biofuel is global- US Brazil China Europe are major player
  - Japan plays by buying
  - Africa and India may join
- Biofuel is it infancy- in the US and Brazil
  - 4 million hectare in Brazil
  - 5-6 Million acre in the US
- It is small for energy but big for ag
- It is work in progress depending on policy technology&other fuels
- There is a large potential for increased cane biotech
  A big potential to increase corn biofuel in US
  - But in US cellulous is the key for large scale expansion
The importance of complementarity

• You need adjustment at the pump and at the wheel (the flex car) the increase demand for biofuel

• Development of a new ag industry is a two step dance
  – Need both processing capacity and production

• That lead to need for contracting and other insurance and even support effort
It is an industrial adoption problem now

• With Sugar cane and corn the real investment is processing from corn to biofuel and residual material (distillers grain)
• Biofuel grew where processing capacity was established. Adoption of processing technology is S shaped
• We are in the middle of a take off period
• Need to understand
  – the economics of investment in processing
  – The economics of growing biofuel crops
  – Contract and relation from farmers to processors
  – Role of policy in adoption-
    • higher subsidy seem to induce adoption
Ag and energy are interdependent

• The economics of biofuel depend on the price of crude
  – This is the second coming
• Need to study biofuel within context of energy and climate change
• Ag policy may be integrated with energy policy
• Biofuel is subsidized for reasons of national security and environmental externality
• Ag Policies in transition to energy emphasis
  – Modify CRP allow production of biofuel
  – Insure farmers against low biofuel prices (deficiency program for biofuel)
  – Consider Insuring processor against low energy prices
Biofuel solves some problems and raises other

• Biofuel is good for
  – Farmers
• rural development(47 Billions)
• climate change,
  – energy independent-

• but
  – it increases food prices,
  – increase risk of shortages as inventory decline( in relative terms)
  – and may be bad for the poor.
Biofuel - lesson in technological change

• Innovation and change are induced by economic and political realities
• It takes complementary Public and Private actions
• Change combines several technological breakthroughs with continuous gradual improvements
• Needed Breakthrough
  – Pretreatment of cellulosics
  – Nitrogen fixation
  – Cheap and effective Enzymes
Evolution of technology

• Basic work is mostly done or financed by private sector

• Technology transfer leads to subsidized yet mostly private sector financed development

• Industrial evolution
  – emergence of new players (Broin) combining knowledge and finance
  – Old players reinvent themselves - mergers & acquisition
  – It take local entrepreneurship to lead and attract innovation
Modeling issues

• Long term and short term elasticity
  – The unconstrained demand for biofuel is elastic - especially when it is a small fraction of the supply for oil. But short term demand for corn for biofuel may be inelastic because of capacity constraints.

• Residue management-
  – what will happen to the residue
  – What is the value of the residues by products
  – How distiller’s grain etc affect other market

• How to model the evolution of the technology?
• How to model the IO of energy/nexus
Modeling issue: Biofuel and energy pricing

- Fossil fuels pricing is a dynamic problem
- It is a game between Oil producers and buyers
- How Build up of alternative energy capacity changes energy pricing
- How energy pricing will affect biofuel evolution
- Complicating factor- Climate change
Modeling framework

• There are several global food models- biofuel is added
  – Some are partial equilibrium
  – Other CGE

• Challenge
  – Incorporate policy in models
  – Move multiple market- link ag to to energy markets
  – Another linkage biofuel and byproducts
  – Have a system of sectoral models linked together

• Introduce dynamic elements

• Predict Impact on asset values

• Impact modeling requires information on key parameters
Econometrics

- Estimation of biofuel productivity (multi-product, multilevel) and supply
- Adoption (risky choice) when and where new plants will develop? How incentive will affect them? Increase in capacity
- Demand (consumer, oil company, residue product)
  - Do you study gasoline market or reduce forms?
  - How prices, polices and market situation will affect demands?
  - Residue demand
- Trade, market clearing and price transmissions (biofuel linkage to fuel, crops to livestock)
- Data is lacking - may need surveys
- Identify key parameters to be estimated for other task
Research issue: Climate change and biofuel

• Contributing of Biofuel to build up of global warming gases
  – Substitution of fossil fuel
  – Expansion of farming

• How to compensate Biofuel within cap and trade frameworks
Policy Research

- Ag policy emphasis shifts from payment to farmers to payment for environmental services and sustain biofuel
  - High Commodity prices remove needs for support
  - Environmental services are yet genuine
  - Biofuel would lead to adjustments
    - Support payment in time of low oil prices
    - Assurance of food availability in times of high oil prices

- Energy policy- what about taxing fuels? Other energy sources?

- Climate change policy-
  - Carbon Credit for biofuel
  - Biofuel as part of clean development mechanism

- Development issues
  - Poverty and food security impacts of biofuel
Science and technology policy

• Biofuel is research dependent -
  – need resources
  – Effective IPR

• Higher food productivity will reduce negative side effect of biofuel
  – Need technology regulations that will facilitate change and safety

• Research on Permitting and regulation is crucial
We move from one temporary solution to another

- Corn ethanol is a stop gap measure
- Sugarcane will stay, as well as palm oil for bio diesel
- The yields of these crop will go up—they are not finished yet.
- But there will be a synergistic relation between developing ethanol from corn, sugarcane and research on celluloids to generate high value second generation fuels
Ag is changing

• Biofuel is a major shift
• Ag is more than food and fiber
• Ag econ is more than “Ag+natural resources”
• Ag policy is part of resource and energy policy
• We need to build a continuous effort to build capacity to study this transition
• What is next?