U.S. House of Representatives: Agriculture Committee
Subcommittee on Conservation, Credit, Energy, and Research
Indirect Land Use Effects of Biofuel Production
6 May 2009 Public Hearing
Robert Kozak
President, Atlantic Biomass Conversions, Inc.
Board Member, Advanced Biofuels USA, Inc.
507 N. Bentz St.
Frederick, MD 21701
301.644.1396
Atlanticbiomass@aol.com

Mr. Chairman:

With EPA's release of proposed rules for the 2010 Renewable Fuel Standard (RFS2) yesterday, the focus of today's hearing will undoubtedly be the role of indirect land use in the lifecycle analysis of biofuel Green House Gases (GHGs) that is being proposed by EPA.

This is a very important topic. However, as Congress considers the analysis that is being proposed by EPA to qualify biofuels for RFS2 economic benefits, I think it is important for Congress not to lose sight of the larger picture of energy independence, GHG reductions and the role advanced biofuels could play in solving these critical problems.

To begin with, we should all remember that the RFS is a "floor" and not a "ceiling" for advanced biofuel production. For instance, the total RFS ***Year 2022 goal of 21 billion gallons/year*** of cellulosic and advanced biofuels ***constitutes less than 20 percent of the projected 110 billion gallons that would consumed by light duty cars, SUVs, and trucks***. (See Table 2 below.)

Since the ***US imports nearly 70 percent of the petroleum used*** by light duty vehicles, a ***great deal more than 21 billion gallons per year will have to be produced*** to see a significant reduction in off-shore imports. And, since this additional production will not be eligible for RFS economic benefits, the ***GHG calculations made by EPA for biofuels will be totally irrelevant***.

What will not be totally irrelevant though, is this question.

Will the US be able to sustainably produce, both economically and environmentally, over 60 billion gallons a year of advanced, non-food biofuels throughout this century?

To answer this question, we must first look very closely at land use in the United States.

I. Trends in US Agricultural Land-Use

As the largest single user of transportation fuels in the world, the US drives that market, both for non-renewable and renewable fuels. If the US is able to meet its projected imported needs with "home-grown" non-food advanced biofuels, stress on the worldwide markets for petroleum and renewable fuels will be considerably lessened. The dire indirect land use predictions of Delucchi that are included in the GTAP (Global Trade Analysis Project) Model will simply not happen.

However, current agricultural land-use trends in the United States are not encouraging.

From 1982 to 2003 approximately 63 million acres were taken out of agricultural production. Of that, approximately 30 million acres went into Conservation Reserve Protection (CRP). The rest was converted from agricultural land into developed land, primarily housing developments. As shown in the following table, based on the latest National Resources Inventory compiled by USDA/NRCS, the loss of land to development is consistently about 7% nationwide.

Table 1
USDA/NRCS 2003 National Resources Inventory
(Values in Millions of Acres)

Nationwide	Cropland	Pastureland	Forest	Total	% (-)	Developed	% (+)
1982	419.9	131.1	402.4	953.4		72.9	
2003	367.9	117	405.6	890.5		108.1	
Net Change	-52	-14.1	3.2	-62.9	-7%	35.2	48%

New England Mid-Atlantic	Cropland	Pastureland	Forest	Total	% (-)	Developed	% (+)
1982	13.7	7.4	63.8	84.9		10.3	
2003	11.4	5.6	62.7	79.7		15.2	
Net Change	-2.3	-1.8	-1.1	-5.2	-6%	4.9	48%

South Atlantic-Gulf	Cropland	Pastureland	Forest	Total	% (-)	Developed	% (+)

1982	26.8	15.5	93.2	135.5		11.6	
2003	18.5	13.9	93.3	125.7		20.8	
Net Change	-8.3	-1.6	-0.1	10	7%	9.2	79%

The 35 million acres of agricultural land transformed into housing developments has, for the foreseeable future has been lost to all agricultural activity, including bioenergy crop planting.

To demonstrate the importance of this land loss, this acreage represents between ***49% and 58% of the total acreage*** that would produce enough ethanol to ***power the entire US light-duty fleet vehicle fleet in 2015*** (including vehicles entering fleet with new CAFE standards).

Table 2

US Total "Cellulosic" Ethanol Demand & Production

2nd and 3rd Generation Biofuel Production Using Cellulosic/Hemicellulose/Pectin Biomass

Vehicle Numbers and Fuel Usage from 2007 US DOT Statistics

US Light Duty Vehicles Cars/SUVs/Trucks	231,000,000
Miles/Year/Vehicle	12,000 (average)
Gal/Year @ 25 miles/gal Ethanol (Equivalent to 32 miles/gal Gasoline)	480
Gal/Year US Total	110,880,000,000
Acres Needed@1,850 gallons/acre 12 tons/acre & 55% biomass-biofuel conversion	59,935,135 Acres
Acres Needed@1,540 gallons/acre 10 tons/acre & 55% conversion	71,116,372 Acres
1982-2003 Development Loss: 35 Million/Acres Percent Total Land Needed	**49-58%**

The significance of the land lost to development cannot be overstated. If the United States is seriously committed to an energy future that virtually eliminates imported oil and uses biofuels and bioenergy to reduce GHG emissions, then the 1.7 million acres of farmland lost yearly must be addressed. If not, by the 2030 timeframe the US may not have sufficient acreage to produce even 50 billion gallons/year without affecting food production and costs.

II. Recommendations to Preserve US Agricultural Land and Maximize Advanced Biofuel Production

Preserving agricultural land for both food and bioenergy production is by definition both a Federal and a local responsibility. While land-use regulation is primarily a state and local responsibility, the establishment and maintenance of land reserves relies primarily on Federal funding. More important, it is Federal farm policy that can provide the market and other economic incentives needed to keep agricultural land from changing to cul-de-sacs. Therefore, a unified sustainable Federal agricultural and biofuel policy should include the following five recommendations.

1. Assure Sufficient Income for Biomass Growers to Practice Sustainable Cropping Practices

2. Focus Biofuel R&D on Increasing Conversion Efficiencies

3. Reform CRP Rules to Assure Sustainable Bioenergy Crop Production

4. Include Federal Lands in Sustainable Bioenergy Crop Production

5. Better Understand Affects of Local Land-Use Policies Including "Smart-Growth" and "Slow-Growth"

1. <u>Assure Sufficient Income for Biomass Growers to Practice Sustainable Cropping Practices</u>

The simplest, but most accurate, definition of sustainable biomass farming is to pay the grower enough money for the crop so that he or she can continue to produce maximum yields year after year while maintaining state-of-the-art environmentally sound practices. A well-thought out implementation of Section 9011 of the 2008 Farm Bill is a good first step.

However, some type of a guaranteed biofuel price structure must be established as well. With such a structure, possibly including a reverse fuel tax, growers will have incentives to buy or lease additional marginal land for biocrops. The stabilization, or increase in value, of these lands will decrease the need of retiring growers to sell the land for residential development.

2. <u>Focus Biofuel R&D on Increasing Conversion Efficiencies</u>

Projects funded from the Biomass Research and Development Initiative (BRDI) have recently produced substantial gains in the yields of potential bioenergy crops. Test plots of perennial grasses are producing over 7 dry tons/acre and energy sorghums are producing over 12 dry tons/acre, both with minimal nutrient inputs.

The overwhelming challenge is now to convert at least 85% of this non-starch carbohydrate biomass, mostly hemicelluloses in addition to cellulose, into useable fuels. If we can produce the needed high-speed targeted enzymes and efficient sugar-to-fuel technologies, ***yields of 2,000 gallons/acre will not be out of the question***. This result is less land needed for biofuels.

3. Reform CRP Rules to Assure Sustainable Bioenergy Crop Production

The USDA Conservation Reserve Program (CRP) has been an outstanding success. Over 33 million acres have been banked in the program since its inception. However, since CRP is a voluntary program, growers have the option of not renewing. CRP land could therefore be converted to bioenergy crops without any guarantees that sustainable practices were being followed. Therefore, Congress should strongly consider establishing another category of reserve land called the "Energy Conservation Reserve" that would address this need. An initial goal should be approximately 15 million acres. These reserves would consist primarily of CRP land determined to be on the lower end of environmental sensitivity that could be harvested on at least an annual basis. Native species with high biomass yields (at least 3-4 tons/acre) would be required as would planting and harvest procedures that would minimize the impact on nesting species. Since no substantial bioenergy harvest income could occur until about 3 years after initial planting, the establishment of such reserves would require some form of subsidy for this period.

4. Include Federal Lands in Sustainable Bioenergy Crop Production

Approximately 400 million acres are in the Federal land system. While many of these sites are National Parks and Monuments and are therefore off-limits for bioenergy cropping, there are still a substantial number of acres that could be used. On the basis of an up-to-date census that includes vegetation history, current rainfall/nutrient characteristics, and most important 20 and 50 year projections of Climate Change effects (rainfall decreases, water level increases, etc.) USDA, Dept. of Interior, BLM, etc. should produce a "best-use" sustainability guide for the land. The purpose would be to establish which crops/trees would be sustainable (including carbon removal parameters) in the various ecosystems. On the basis of this information long-term bioenergy harvest leases with enforceable sustainable "best-practices" would be granted. These leases would also meet CO_2 capture and recreational use goals.

5. Better Understand Affects of Local Land-Use Policies Including “Smart-Growth” and “Slow-Growth”

In the past two decades many states and local jurisdictions have established land-use policies that were intended to preserve agricultural land. Unfortunately some of these "slow-growth" or "smart-growth" policies had unintended consequences that actually accelerated the conversion of agricultural land to residential uses. One very interesting example is the slow-growth policies enacted by the outer suburbs of the Washington DC region.

Using time series of 30 $meter^2$ LANDSAT infrared images the Metropolitan Washington COG in 2004 quantified land use for the period 1986-2000. While the land use trends from 1986 to 1996 showed more compacted development centered around transportation nodes such as METRO, the development trend of 1996-2000 showed a different and unexpected pattern. In the mid 1990s most of the outer counties elected "slow growth" officials in reaction to what was seen as these counties becoming what people had tried to move away from - congestion, high density development, crime, etc. The "slow growth" zoning changes that were enacted tried to control growth by increasing lot sizes. This meant carving existing farms and orchards into 5-10 acre "McMansion" developments. This change in development patterns registered clearly in the LANDSAT imagery. Well intended local policy decision such as this should be studied and learned from before new land preservation programs are enacted and funded, especially if USDA rural development money is to be used.

III. Recommendations for Evaluation of Biofuel GHG Changes

1. Indirect Land Use Calculations Should Not Be Included in the EPA 2010 RFS Regulations

The calculation of the world-wide relative indirect land-use effects of different energy sources is very complex and is very data intensive (Appendix 1 includes a simplified biofuel GHG model design). Anyone familiar with the history of coupled climate change models knows that this effort takes time. Data from such sources as LANDSAT and other satellites, carbon flux-towers and soil sensors located in a variety of growing conditions, and land transfer and taxation offices needs to be collected and calibrated. A number of different data-rich models need to be written, tested, and calibrated against real-world data sets before they can be used for policy purposes.

It has taken Climate Change researchers over twenty years to achieve the necessary level of confidence in these models to produce the 6^{th} round of IPCC Climate Change projections. And, even after all this work, these models are not used to enforce regulations to level of detail that is being proposed in the EPA RFS2 regulations.

Instead, a direct land use model that is able to model both current and future crops, conversion technologies, and biofuel production systems should be used. The key algorithms of the model (in simplified form) should be:

(1) Land Use Net Change in GHG Emissions =
(Net Change in Land Productivity ± Net Change Nutrient Inputs ± Net Change Farming (energy crop vs fallow land, etc.) ± (nutrients added – biomass left)± (fuel use, etc.)

(2) Biofuel Production GHG Emissions (Compared to Non Renewable Gasoline) =
% Fuel from Renewables – (%Conversion Losses+ GHG losses)+ Food/Fuel Residues

2. Future Potential Addition of Indirect Land Use Assessments for All Energy Sources

While the future worldwide indirect land use changes caused by US biofuel production and use can be significantly minimized as discussed above, the analysis of biofuel production and use as compared to the use of other energy sources such as coal or nuclear produced electricity should be considered. Such a model should include a methodology to evaluate local, state, and national land use policies for their affects on biofuel demand and the availability of agricultural land. (Appendix 2 includes a policy evaluation methodology.) As the discussion on "slow-growth" land use policies showed, non-biofuel policies can have unexpected but very significant effects.

To that end EPA should join with the National Academy of Sciences to develop a work program that would produce models capable of evaluating complex energy land use scenarios based on empirical data sets. While this may take a while, the fight to regulate GHGs and to mitigate climate change will be a long and earth-changing one. It is more important to get the decisions on future fuels right than to support a short-term policy decision.

In the meantime I strongly urge the removal of the GTAP (Global Trade Analysis Project) Model, which has been adopted by the California Air Resources Board, from use in the EPA RSF regulations. The GTAP model, it is not anywhere near meeting the requirements of the coupled climate change models currently being used for IPCC analyses. In fact, it is hardly a model at all in the formal sense of that term. It is simply a collection of equations based on some assumptions that have not been tested with real-world data. Therefore, EPA would be placing itself in a very precarious position by adopting it for regulatory purposes.