The Center for BioEnergy Sustainability (CBES)
At Oak Ridge National Laboratory (ORNL)
is pleased to announce that we are holding our next Forum on

Thursday July 14th, 2014

in the Ocoee Room (Room 189) in Building 1505 starting at 3:30pm

This month's forum topic is:

"GIS-Based Allocation of Lignocellulosic Biorefineries" – A Case Study in Texas

Guest Speaker:

Daniela S. Gonzales

Ph.D. graduate student in the Department of Agricultural and Biological Engineering at Texas A&M

Abstract:

The objective of this study was to identify the location of biorefineries and depots (or collection facilities) in Texas using the estimated biomass available per county (DMT/year) presented in the 2011 Billion Ton Study, the 2006 National Land Cover Data (NLCD), and road and rail networks. This study analyzed data for primary crop residues (barley, corn, oats, sorghum and wheat residues) and annual and perennial dedicated energy crops (sweet sorghum and switchgrass) from a high yield scenario of the Billion-ton Update Report. A heuteristic model was developed to associate potential biomass production to transportation networks, and, therefore, potential facilities, using a series of iterative raster-based analysis tools. The advantage of this model is that it considers only production from a single price feedstock realization and allows for analysis of the sensitivity of that production level. First, biomass was distributed to land types from the NLCD identified as suitable for production of energy crops and collection of residues. Only areas with an average precipitation greater than 25 inches and north of the 28 ◦N longitude were considered. Tools available in the ESRI ArcGIS software were used to compute the geographical distribution of the estimated biomass per county assuming equal distribution across suitable lands. The biomass per county data and the suitable area were combined in ArcGIS to estimate the available biomass at a one square mile grid size in the state of Texas for year 2022. Focal statistics of "realized biomass production" were generated for biorefineries locations using a 50-mile radius and for depots using a 20-mile radius. Biorefineries and depots were assigned to pixels based on proximity of biomass to roads and rails. Grids between 129 thousand DMT per year and 42 thousand DMT per year were identified to be potential depot locations. The results of this study show that a total of 6 million DMT per year could supply up to 15 biorefineries in the state of Texas. Assuming a conversion rate of 85 gallons per DMT, a total of 508 million gallons of advanced renewable fuels could potentially be produced by the state of Texas by year 2022, or about 2.4% of the cumulative advanced biofuels goals set by the Renewable Fuels Standard. The advantage of this approach is that it allows the user to test optimal refinery locations using multiple feedstock production realizations at a fixed price. Future results

may exploit this advantage using enhanced supply curves which take into account the supply sensitivity to agro-climactic conditions and constraints for bioenergy crop production.

Bio:

Daniela S. Gonzales is a Ph. D. graduate student in the Department of Agricultural and Biological Engineering at Texas A&M (TAMU). She has a B.S. and M.S. degree in Industrial and Systems Engineering and a Minor in Mathematics from Mississippi State University (MSU). Her Masters theses titled "Identifying factors and quantifying their impact on transportation costs of pre-processed biomass", was based on a collaboration between her advisor at MSU, Sandra Eksioglu, and Erin Searcy from Idaho National Laboratory (INL). She is currently involved in two different projects under the supervision of Dr. Stephen Searcy from TAMU. The first project objective is to allocate biorefineries and depots (or collection facilities) using geographical data such as the National Land Cover Data, rail and road networks, and feedstock supply projections from the POLYSYS model. She is currently collaborating with Laurence Eaton at Oak Ridge National Laboratory (ORNL) in order to test the sensitivity of potential biomass under different scenarios in POLYSYS and to evaluate the biomass supply curves along the 100th Meridian. She plans to use the state of Texas as a case study.

She is also in charge of modifying the IBSAL model for the Biomass Optimized Delivery System (BioMODS), an AFRI project with Dr. Stephen Searcy (from TAMU) and Dr. Kevin Shinners from the University of Winsconsin. The primary objective of this project is to integrate mechanisms and processes proven successful in forage, cotton, and container industries to achieve a logistics system that will produce a lowest-cost biomass feedstock.

Please mark your calendar for every third Thursday for 2014 so that you can join in the collaboration and camaraderie that is being built by your participation in the CBES forums.