Monthly Highlights from Rutgers New Jersey Agricultural Experiment Station November 2009

Finding Conservation and Using Bio-Energy on Urban Fringe Farms

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The changing technologies farmers adopt in response to rising costs of crop production energy inputs lie at the core–the very heart–of agricultural viability and sustainability. Ultimately, energy used in farming finds its way into our food security, national security, and national freedom. These technology challenges focus us on immediate gains realizable from on-farm energy conservation, through longer-term development of renewable energy resources from agriculture.

Decades before and after the 1970s energy crisis, Rutgers provided energy input and conservation with crop variety improvements offering higher yield per acre using fewer inputs, reduced tillage, drip irrigation, efficient greenhouse heating, and numerous other technologies. We continue developing technologies improving the economic sustainability of agriculture after the 2005 spike in energy prices. Nearing release in winter 2009 is a website with tested methods for conducting on-farm energy audits. While utility companies and consultants have tools for assisting residential or industrial customers in managing and conserving energy use, they know comparatively little about monitoring energy use on farms.

While conservation is where farmers and the university make great immediate impacts; renewable energy sources, particularly biomass energy, gained significant attention because of agriculture's ability to capture the sun's energy in plant biomass. Biomass energy comes from two main sources: crop production (i.e., corn grain, switchgrass) or plant residues and wastes (i.e. corn stalks, municipal leaves, wood chips, food wastes). The Rutgers' EcoComplex has projects on utilizing waste products for energy. Among them is methane extraction from the neighboring Burlington County landfill for combustion powering gas micro turbines supplying energy needs to modern, efficient greenhouses. Another project involves converting the combination of food waste and horse manure to biogas through anaerobic digestion.

Dr. Stacy Bonos in Rutgers demonstration plots of Switchgrass and Miscanthus

Another unique approach is growing tree nut crops on marginal soils. For more than a decade, Rutgers has evaluated hazelnut and other temperate zone tree nuts for their production in New Jersey. Hazelnuts can produce up to twice as much oil per acre as soybeans and have the potential to be more sustainable on marginal sloping lands typically not used for row crops like soybean.

A recent comprehensive study by NJAES (commissioned by NJ Board of Public Utilities) identified the availability and conversion potential of many agricultural and municipal waste streams in each county of New Jersey. The results are highlighted in our report found online at: www.njaes.rutgers.edu/bioenergy.

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Samples of grass pellets and briquettes prepared for experimental combustion output trials.

For urban fringe farmers on high value land, biomass energy opportunities potentially exist growing crops for energy; particularly on lands not well-suited for food or feed crops production. Switchgrass and other tall growing perennial grasses receive attention as biomass energy crops in the U.S. and here in New Jersey. Switchgrass is a native, perennial Prairie grass growing 7 to 8 feet tall. Once established, it can produce five or more tons per acre from one fall or winter harvest; even on marginal soils with low inputs.

Dr. Stacy Bonos, a Rutgers NJAES grass breeder, is conducting evaluations and breeding of several grasses adapted to less productive soils in New Jersey, using minimum inputs and conservation properties. Conservation uses have been a focus with several species by USDA's Natural Resources Conservation Service in New Jersey. Rutgers NJAES Cooperative Extension of Middlesex County's EARTH Center recently established a demonstration trial where Switchgrass varieties will be compared, and followed through harvesting, pelletizing, and burning in a biomass furnace/boiler to provide heat for onsite buildings.

Wood pellets are a source of fuel for smaller furnaces and stoves, but their recent popularity has led to price increases or shortages. Thus, pellets are a potential alternative market for crop biomass. Rodger Jany and Zane Helsel teamed with several Central New Jersey farmers to evaluate using rained-on rye straw and unused Sudangrass hay from the 2009-growing season for biomass energy feedstock processed through a local commercial wood pelletizing operation. Traditional small rectangular bales of these two grasses were chopped through a farm feed grinder/mixer. The chopped biomass was fed into the pelletizer, either alone or with pine sawdust, which improved the binding, resulting in smoother, firmer pellets. Lab results of the pellets indicated that in comparison to wood pellets, which were nearly 8400 BTUs/lb on a dry matter basis with less than 1% ash, the rye was similar in energy content but had just over 2% ash. The Sudangrass hay was about 10% lower in energy and had ash values of over 8%. These results are typical of studies which suggest weathered grasses can have energy/ash values approaching that of wood.

Although farming in the urban environment of New Jersey offers many challenges, it also provides opportunities marketing higher value horticultural crops. Growing energy crops on good quality, high-value land will not be economically competitive compared with fruits, vegetables, nursery, and other crops. However our Rutgers work to date suggests that utilizing biomass wastes/residues, like rained-on hay, or growing crops on unmanaged open preserved farmlands, may provide farmers with alternative outlets for such biomass and sources of local energy. This production does not compete directly with large farm states, where there are huge contiguous cropland acres to feed big biomass refineries, but may provide farmers with opportunities to produce energy sustainably in meeting part of their energy needs.

Rutgers NJAES Cooperative Extension will continue offering practical technologies for New Jersey agriculture to use energy inputs efficiently, and evaluating the potential to grow and use biomass energy. To learn more about these and other new possibilities, consider attending our 2-day session on Bioenergy at the Atlantic Coast Ag Convention on January 13-14 in Atlantic City. ❑

2010 Atlantic Coast Ag Convention & Trade Show
January 12 - 14, 2010
Trump Taj Mahal, Atlantic City, NJ
http://www.njveggies.org/convention.htm

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Our work benefiting farming sustainability and quality of life in New Jersey depends on gifts from people sharing our Rutgers NJAES vision for a vibrant, healthy, profitable urban fringe farming community. We invite you to join us. Please contact Jack Rabin at 732-932-5000 ext. 610 or rabin@njaes.rutgers.edu.