GBEP Working Group on Capacity Building for Sustainable Bioenergy (WGCB) Activity Group 6 - "Bioenergy and Water"

WEBINAR
"Examples of Positive Bioenergy and Water Relationships in the Americas"

25 May 2016

Summary

Background

Ms. Michela Maria Morese and Mr. Göran Berndes briefly explained the history of the Working Group on Capacity Building (WGCB) Activity Group 6 (AG6) on bioenergy and water as well as the background of this event. The AG6 was established in 2015 to identify and disseminate ways of integrating bioenergy systems into agricultural and forested landscapes to improve the sustainable management of water resources, including wastewater. Part of this process involves sharing knowledge and experiences on landscape identification and design, best management practices, policy instruments and technologies that support the implementation of bioenergy that contributes positively to the state of water.

The GBEP Secretariat, with the support of IEA Bioenergy, issued a "Call for Good Examples" in April 2015. The initiative aimed to catalogue and highlight worldwide examples of bioenergy systems throughout all stages of production that can produce positive impacts on the status of water. A workshop was subsequently held in Stockholm in August 2015 in which a representative sample of the submissions received were showcased and then an outcome report detailing a number of examples was published in February 2016. Mr. Göran Berndes also presented the key messages from the Stockholm workshop. It was determined that while an encouraging variety of options exist, a number of barriers in the mainstreaming of such practices remain, which is why the focus should be on capacity building. Another one of the key messages was that most of the best practices presented are "bottom-up", but many policy makers view issues "top-down", which means that key issues must be translated into a more suitable language and highlight the potential of governance, including economic incentives, in fostering sustainable bioenergy-water systems.

The AG6, in conjunction with IEA Bioenergy Task 43 – assisted by Task 40 – decided to host two webinars in 2016 (one on 6 April to be focused on Africa, Asia and the Pacific, and Europe, and another on 25 May to be focused on the Americas) to further disseminate the results from the April 2015 'Call for Good Examples' and inspire participants to build on these experiences with other bioenergy producers in their respective countries.

Webinar Presentations

Mr. Guillermo Parra presented first on, "Vinasse concentration for water use reduction." In Paraguay, vinasse is typically stored in lagoons, which increases the possibility of contaminating local watersheds. The government has enacted strict regulations to stem watershed contamination at

ethanol plants, leading two plants to add vinasse concentrators. These concentrators use a plate and frame membrane module system, which is an open channel filtration system that allows for application of membrane-based separation systems to high COD and BOD streams without inherent problems of membrane fouling. The permeate output has the ideal acidity to be re-used in the fermentation process at the ethanol plant, which means less make-up water needs to be pumped from the watershed or river. The reject output is concentrated vinasse that is then used for fertigation to increase sugarcane yields, saving energy and money in the pumping and distribution system.

The selected technology was considered to be the best alternative for this particular application, considering results of similar applications in Latin America and India as well as operational issues like steam availability at the plant. The main challenges encountered during the implementation of this new technology system were related to operation and maintenance, particularly the costs associated with the membrane. The feasibility study focused on the economic outcome, so it was important to have a good estimation of these costs. The membranes' performance and useful life is a function of operation variables, especially operating pressure and operation continuity. The correct maintenance and cleaning of membranes is also critical. Lastly, as the system has a modular architecture, up-scaling inside the plant and replication at other plants is easy.

After Mr. Parra's presentation, *Mr. Marcelo Alves de Sousa* spoke about, "Sustainability in movement: Water energy nexus in southern Brazil." The International Center on Renewable Energy-Biogas (CIBiogás) developed a project in partnership with ITAIPU Binacional, Scania do Brasil, Haacke Farm and the Itaipu Technology Park Foundation. Haacke Farm is located in Santa Helena, Paraná in southern Brazil, and it has 84,000 laying hens and 750 heads of cattle. Since 2013, it has directed around 35 m^3/day of liquid effluents to a covered lagoon biodigester for anaerobic digestion of residues, yielding a daily production of 1,000 m^3 of biogas. The electric energy generated meets 100 percent of the Farm's demand, including laying hens heat (in winter) and cooling (in summer). The surplus of biomethane is used to supply fuel to 43 vehicles of the official fleet of ITAIPU Binacional Dam.

The biogas production and its refinement to produce biomethane is directly related to water as the agricultural residues and animal dejecta, the main biogas sources, are large polluters of water resources. In general, these residues and dejecta are treated in a precarious manner, which directly affects the environment, soil and groundwater. Removing these animal or vegetal biomasses from the environment to produce biogas and biomethane provides rural sanitation, and it is an excellent energy source. The removal of these residues also enhances the social conditions of farmers and their families by not only reducing the bad smell from the organic material and the mosquito population but also has the potential to increase the number of jobs available in the area.

CIBiogás has a biogas laboratory that analyses the quality and quantity of biogas produced in its Production Units. The CIBiogás Laboratory also has partnerships with the Brazilian Agricultural Research Corporation (EMBRAPA), the University of Natural Resources and Life Applied Sciences of Vienna (BOKU University), and the United Nations Industrial Development Organization (UNIDO).

Next, *Mr. Devendra Amatya* gave a presentation on, "Impacts of switchgrass intercropping in traditional pine forests on hydrology and water quality in the southeastern United States." There are approximately 15 million ha of pine (*Pinus spp*.) plantations in southeastern United States. Switchgrass (*Panicum virgatum* L.), as a cellulosic biofuel crop, intercropped in between pine (*P. taeda* L.) tree rows has the potential to produce a cellulosic energy crop without using land currently in food production or used by an unprofitable mixed understory. Recent studies have shown that switchgrass has the potential for long-term sustainability and for reducing environmental effects of bioenergy production compared to

corn/row crops. This novel intercropping technology may not only reduce dependency on fossil fuels, but also benefit the American agricultural economy. Space, nutrients and water between pine beds can be used by switchgrass to increase overall bioenergy production potential of pine forestland, possibly making it economically viable. The pine/switchgrass intercropping practice is also hypothesized to increase site nutrient uptake, thereby improving water quality compared to traditionally managed pine forests.

In 2009, Catchlight Energy LLC, a Chevron|Weyerhaeuser Company joint venture, established a regional research project to evaluate the environmental effects of biomass cultivation in managed pine forests in the southeastern United States as there was an urgent need for information about the environmental effects of cellulosic biofuel production. Although growing and harvesting such crops on managed forest appears to be very attractive, the effects on water resources compared to traditional pine are yet to be evaluated. The water-related research was conducted in three states – North Carolina, Alabama and Mississippi. The project is scheduled to end in September 2016 after extensive field data monitoring on hydrology, water quality, carbon, soil productivity, wildlife habitat, biomass production, life cycle analysis and other ecosystem services. The key results of this multicollaborative research study are still being finalized.

The final presentation was given by *Ms. Cristina Negri* on, “Lignocellulosic plants as buffer zones in the Indian Creek watershed of the United States.” She demonstrated that strategically placed bioenergy plantings in critical field areas can help achieve bioenergy production and the creation of important ecosystem services, such as improving water quality. Riparian buffers, contour buffers and planting in sub-productive areas of a field are possible examples. The research that Ms. Negri and colleagues have conducted has shown that considerable benefits could be derived from this practice at the field and watershed level, including significant reductions in nutrients and sediment loadings to water bodies and reduced GHG emissions. Soils maps and easily available yield maps can be instrumental in positioning the bioenergy crops in locations that target the most vulnerable areas and those that can be cost-effectively converted to bioenergy. When deploying bioenergy crops in vulnerable areas, existing management practices developed for business-as-usual cropping may need to be reassessed to minimize impacts to water. Research still needs to be done to establish minimum patch size and field geometries that would allow farmers to easily subscribe to landscape-based bioenergy cropping and that would provide optimized logistics and economics. Feedback from farmers and farm operators and consultants is essential in designing landscape solutions that are acceptable and likely to be adopted in farms.

Results

This webinar proved to be a good opportunity to share lessons learned from the “Call for Good Examples” and Stockholm workshop and allowed for a number of fruitful interactions amongst participants, with a view to further work on bioenergy and water in the GBEP context.