



# Checking in With CenUSA

## ***Sustainable Production and Distribution of Bioenergy for the Central US***

CenUSA Bioenergy is a multidisciplinary project funded by the U.S. Department of Agriculture-National Institute of Food and Agriculture (USDA-NIFA Initiative Competitive Grant No. 2011-68005-30411 ). CenUSA's goal is to research the production and use of perennial grasses on marginal lands for use as alternative biofuels and bioproducts. More information is available at [www.cenusa.iastate.edu](http://www.cenusa.iastate.edu).

**Albert “Bert” Bennett** served on the CenUSA Advisory Board. Bert Bennett spoke in May 2019 with CenUSA Communications Intern Tyler Worsham about his experience on the CenUSA Advisory Board in his area of expertise in the field of agricultural engineering. Bennett brought his familiarity with the feedstock conversion process and biomass logistics to assist the direction of the project.<sup>1</sup> Learn more about Bert Bennett at <https://www.linkedin.com/in/albert-bert-bennett-86b08226/>.

### **How and why did you join the CenUSA advisory board?**

“I’m an alumnus at ISU (Iowa State University) and did my Ph.D. work in agriculture engineering and biorenewable resources and technology. After completing that academic work, I went to work in industry at a company called ICM, Inc., located in Colwich, Kansas. ICM is a leading engineering and manufacturing firm that helped develop the majority of first-generation ethanol production facilities here in the United States.

One of my tasks at ICM was to look at new and developing thermal conversion technologies and look at how they might be integrated into existing first-generation ethanol production facilities. Those early efforts led to my helping develop, design, and build a commercial-scale biomass gasification facility, which we used to demonstrate the technology. One of the benefits of operating that demonstration facility was that we were also able to produce large volumes of biochar . Much of that biochar was supplied to local farmers and major research institutions, including ISU (Iowa State University). I assume the reason why CenUSA asked me to join the advisory board was because of my expertise with thermal conversion technology



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<sup>1</sup> All of the words and ideas expressed in this interview fairly and accurately represent the speaker. Some quotes may be paraphrased for brevity and clarity. The opinions expressed in herein do not necessarily reflect those of Iowa State University, USDA-NIFA, Purdue University, Ohio State University, USDA-ARS, the University of Minnesota, the University of Nebraska, Lincoln, the University of Vermont, or the University of Wisconsin.

and industrial-scale biochar production.”

**Could you go into more detail about your professional background as it relates to your role with the advisory board?**

“When I was completing my academic studies at Iowa State, a lot of what I was looking at involved modeling logistics and conversion of biomass fuels into energy for a first-generation or modified first-generation ethanol facilities. That academic experience and my knowledge of how to integrate biomass utilization into an industrial process is one area where I feel that my expertise had some value to the advisory board. Also of value was my actual engineering and manufacturing experience with thermal conversion systems and their integration into larger industrial applications, as well as the utilization of these systems for the production of biochar. Those are the areas, I believe, where my expertise was of most benefit to CenUSA.”

**What were some of the most important inputs you personally provided to the CenUSA leadership team?**


“I like to think that some of my insight on biomass logistics was of value to the CenUSA logistics team. I was very impressed with the team that CenUSA put together. In addition to logistics, the area where I like to think I had the most benefit was sharing my experiences with the feedstock conversion team. One of my suggestions, which was also shared by others on the team, included recommending that the team consider integrating fast pyrolysis technologies

and other feedstock thermal conversion technologies into first-generation ethanol production facilities and other industries as a potential market for the large volumes of future biomass produced in the CenUSA region, as well as a platform to demonstrate the value of these new and existing conversion technologies.”

**Could you provide any specific examples of how you applied that knowledge to your advisory role on the board?**

“When attempting to commercially deploy a new technology, it is usually very challenging to accurately estimate the actual investment costs needed to scale up from successful laboratory or pilot scale demonstrations. Speaking from my own personal academic experiences, it is typically very difficult to obtain real-world cost information that can be used in developing a representative Techno-Economic Analysis (TEA) for new biomass conversion technologies, such as fast pyrolysis. Developing a realistic TEA is especially challenging when the new technology is coming from small startup companies or from academia.

The inventors and researchers typically do not have the engineering and construction experiences needed to scale up from lab and pilot scales to commercially viable, large-scale industrial processes. Much of the real-world cost information needed to describe a new technology at industrial scale is also usually tied up as trade secrets or proprietary information; or it requires allocation of limited and costly 3<sup>rd</sup> party engineering and construction management resources. In addition to difficulties in



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estimating costs of scaling up new technologies, it is also common to encounter unexpected and costly engineering challenges.

As a means to bridge the gap between successful lab and pilot scale demonstrations and a commercially viable, large-scale industrial processes, my suggestion to the team was to consider co-locating new feedstock conversion technologies at an existing ethanol production facility. By co-locating at an existing facility, the new conversion technology can be commercially demonstrated at an intermediate scale and take advantage of the facility's existing infrastructure, experienced operations and maintenance personnel. The existing facility can benefit from commercializing new products, likely recovery and utilization of waste heat energy which can potentially reduce the facility's overall carbon footprint. In turn, the inventors and researchers can benefit by having much of the required investment capital dedicated to engineering, equipment manufacturing and installation of the actual systems needed to demonstrate the commercial viability of the new process.

More specifically, I suggested that we consider demonstrating the conversion of biomass at a scale of 100-to200 tons/day, which is at a scale that can provide a good design basis for scaling to future larger applications. It is also at a scale that can be readily supported by the local collection, transportation and handling of biomass in much of the CenUSA's area of interest."

**What specific project objectives do you think directly benefited the most from your knowledge and experience?**

"I think that the thermal conversion team benefited most from my experience, as well as the feedstock logistics team to a lesser extent.

Regarding the other areas, I was appreciative of the opportunity to learn from their expertise."



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[https://cenusa.iastate.edu/files/cenusa\\_2019\\_075.pdf](https://cenusa.iastate.edu/files/cenusa_2019_075.pdf)

**How was the advisory board as a whole able to exert influence on the direction of the project?**

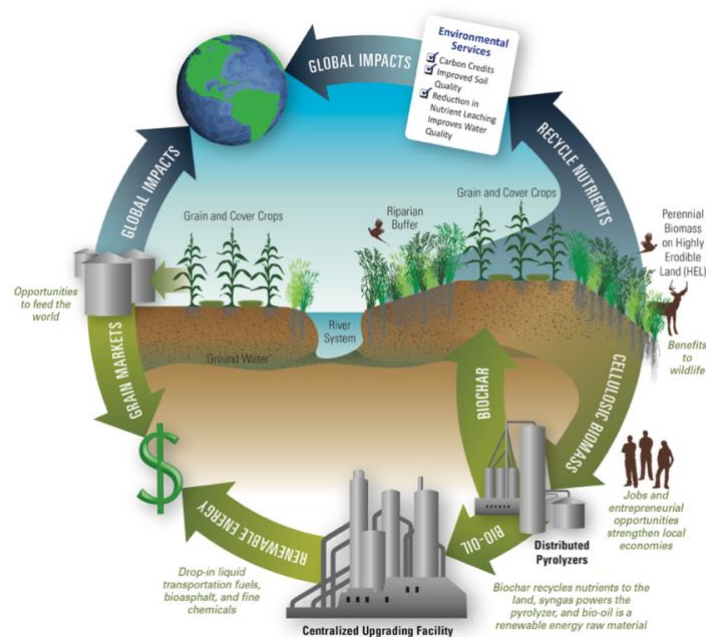
"The advisory board's diverse makeup and combination of experienced producers, equipment manufacturers, industry representatives and state government agricultural representatives provided what I believe to be a lot of valuable guidance and insight to CenUSA's research teams. I was especially impressed with input from actual producers and state government representatives. I'd like to think that hearing directly from producers and their state agricultural representatives helped the CenUSA teams to focus on efforts that would ultimately help local producers and the environment."

**What is the most important contribution that the overall advisory board has made to the CenUSA project?**

“In my view, it was a combination of all of the diverse feedback we gave. We had a lot of really talented individuals on the advisory board, and I personally learned a lot from listening to the other advisors. Hopefully, the board’s comments and interaction with the research teams provided guidance that will ultimately benefit the producers and the environment.”

**How do you think your experience with the CenUSA advisory board will influence your future work?**

“There are many of us in industry, myself included, who are interested in deploying renewable biomass resources and energy systems into our respective industries. By listening to CenUSA researchers and fellow advisory board members, I now have a greater understanding and appreciation for what it would take to produce, handle and utilize large volumes of renewable sources of biomass for industrial applications. In fact, my company is now actually building a large thermal conversion system dedicated to providing a new ethanol production facility with combined heat and power from locally collected biomass.”



**CenUSA Bioenergy Vision**

Learn more about CenUSA at [www.cenusa.iastate.edu](http://www.cenusa.iastate.edu)