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). The goal of the project is to research the production and use of perennial grasses on marginal lands for use as alternative biofuels and bioproducts. Learn more about CenUSA at www.cenusa.iastate.edu.

Dr. Charles Schwab[1], a professor for the Iowa State University Department of Agriculture and Biosystems Engineering, spoke in February 2019 about his role as a CenUSA co-project director in health and safety with CenUSA Communications Intern Tyler Worsham.[2] Schwab expounded on the difficult nature of collecting exposure data and how to most effectively parse through that complex data.

Chuck Schwab

How did you first get involved with CenUSA?

"I believe I was contacted by Jill Euken to work on the safety component of the project."

What made you an ideal candidate for your position?

"Well, I've been working with farm safety and Extension and Outreach since 1990, and I'm kind of the primary point of contact for farm safety at Iowa State University. There was a time when all land-grant universities would have a farm safety specialist, but more recently, only some of the larger schools keep that position filled. That's kind of where I've been. Part of my role in safety as an Extension and Outreach specialist is to keep things working with youth and adult farm safety education, awareness and developing resources. The tagline for ag safety is '*Developing Resources: Making Iowa a Safer Place to Live and Work*.'

To what new ideas and disciplines were you exposed in your work with CenUSA?

"Prior to this, I've worked with faculty from all seven colleges at this institution, but I have never worked as closely with people in a specific project about plant genetics, crop introduction, bio-refinement and economic models which are all major components of the CenUSA project. In other words, most of my work dealt with

[1] Learn more about Chuck Schwab at https://www.abe.iastate.edu/charles-schwab

[2] 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.

equipment, crop harvesting or processing, but not the bio-refinement in the fuels or with a product like biochar."

Have you worked with any projects as large or well-funded as CenUSA?

"Yes. Don't get me wrong, CenUSA was a unique opportunity, but I have been connected with some agriculture safety centers that typically receive $5 million each year for multiple years. That's kind of what CenUSA was like, but I didn't see CenUSA as a center as much as it was a project where these other collaborators were at specific sites with a variety of disciplines. There was kind of a mixture of disciplines like CenUSA, so in some respects, yes, in others, no."

In what other ways have these projects differed from CenUSA?

"In contrast with the other projects, I thought that the Extension part of the CenUSA project was integrated from the beginning and throughout the entire duration of the project. That was very unique and beneficial to me as an Extension person. What you often see is that Extension is the afterthought when the project is done.

From the very beginning of CenUSA, there was this Extension and Outreach effort, making that contact, so that was the big thing for me that really differed in this project. There was much more integration of Extension than I've ever seen compared to other projects. Even in more research focused projects of which I was the director, the Extension component wasn't actually a part of the program. The funding source didn't necessarily have to have that Outreach component in it."

Did you and your team encounter any obstacles in your research, either unforeseen or things that you expected going into it?

"We knew the obstacle in the area we were covering. We think we resolved the issue, but for us, the collection and access of agricultural injury data is and always has been an issue. We're always trying to understand what is happening and how it's happening. We understand that we are trying to get a better picture of the prevalence of something like exposure or injury rate. To what are these injuries connected? From our standpoint, we have always struggled with getting that type of data.

When you are dealing with other industries like the manufacturing industry, there are different reporting mechanisms. The detailing of the reporting and how things are reported are so different, so you can really get down to figuring out what needs to happen. With agriculture, however, we just don't have that level of detail. That creates part of the problems we were dealing with because we were trying to forecast if the bio-production system is less dangerous than a traditional corn-soybean rotation or just the corn farming rotation. The fact that this information about the risk exposure rate is very hard to find was the biggest obstacle for us. We knew it going in, so it wasn't unforeseen, but it was still an obstacle."

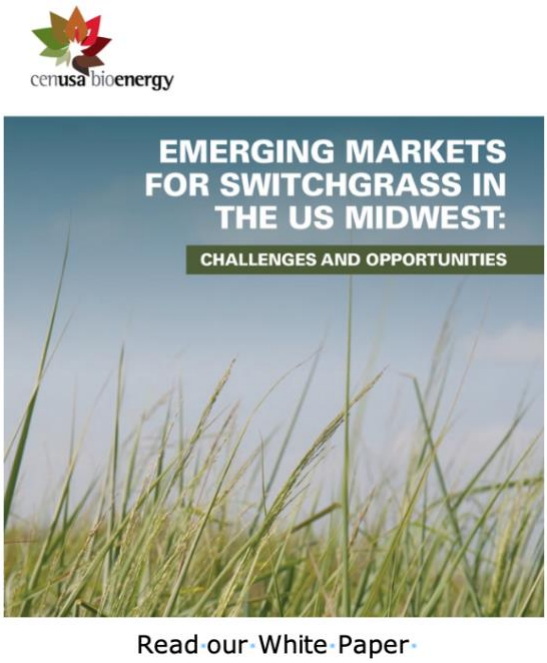
What were some noteworthy discoveries and successes that you achieved in your work with CenUSA?

"I think the biggest one for us was utilizing the agricultural injury data that is collected by national agencies in a way that forecasts expected injury rates between two production systems. There are two facets, knowing that the modeling efforts can constantly be improved as we find better injury and exposure data. The two

factors that limit what we can do is what we know about the types of injuries and what the exposure rates are.

I think the bigger part of what we figured out was that we should look at it from a comparison standpoint. This is subtle. When you are comparing two agriculture-related systems, there are certain things that set them apart, so instead of trying to figure out all of the variations that could happen within a course of a year with all of the tasks a person does, ranging from sitting down, climbing, and so on, you are comparing the two systems and making the assumption that the common tasks are all the same. You have a plethora of individual tasks that you're doing every day. Comparing all of those is a harder way to calculate. By comparing systems, all you're looking at are the things that differ between tasks.

It's sort of like looking at a big equation. These common terms cancel out, so when we compare farmer A and farmer B, you're comparing variables and realizing a lot of them are similar no matter what type of farmer you are. Cancel those things out and clean out all of the clutter. Now you can look at what is on one side with Farmer A compared to what is different on the other side with Farmer B, and really compare those exposures and types of injury differences. I think that from my perspective, it's a simple process that gets rid of the muck of all of the little details and just focuses on those critical differences."



What was the exact trial-and-error process that determined what health and safety measures that were absolutely necessary and those that weren't? What went into that?

"I think it's interesting to use the term 'trial-and-error process' because the safety component of the project did involve multiple attempts at finding the right approach to exploring that main question of performing a detailed risk analysis. In other words, there are a variety of tools that can be used and different industries use them, but when you get down to it, we went through a process of figuring if this or that worked and what's involved if we use them. That's how we came about looking at a comparison model. It removed some of the issues we had with using other risk-assessment models that other industries use.

They usually have more data like the specifics of those injuries, how those injuries occurred, the exposure rates and so on. They had all of those details that made the model easier for them to look at individuals, whereas we couldn't look at individuals in our approach. It was interesting because as we approached these different analysis tools and looked at why they were nice and good, but we found we couldn't apply them."

What were the challenges of assessing those potential risks to farmers and then communicating those risks to them?

“I guess the biggest challenge was in assessing the potential risk to farmers. That was the hardest component for me, no matter if it was for biofeedstock or traditional crop production. There are so many barriers to success. Again, it goes back to the lack of injury and exposure data for formulating accurate risk assessments.

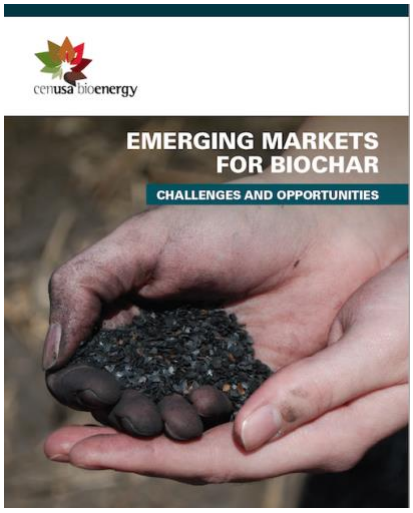
To put it into perspective, if you were trying to determine which vehicle is safest to drive, we’re determining which of the two production systems are safer. If you translate it into something everyone does, there is so much data about which cars are involved in collisions and what the speeds and conditions are. Every time something like this happens, there is a report being generated that is being collected by all of these agencies into these massive databases with all of this information.

In agriculture, however, you’re not going to get any of that information. You’re not going to know what the weather conditions there were, you won’t necessarily know all of the things that led up to that specific injury, and at best, you sometimes don’t even know what (part of a person) was injured, how it was injured or how long a person has been doing those things. There are just so many factors. Even cars have so much diversity from the number of manufacturers to the number of years, but when you think about an agricultural operation, you have so many regional, geographical, philosophical, and equipment differences.”

How much does health and safety play into decision about whether or not farmers want to invest in perennial feedstocks?

“It’s hard to answer because health and safety aren’t necessarily evaluated in the same way as decisions to produce one crop over another. I’m not saying that people don’t think of their safety. I just don’t think that choice for safety bubbles up to the top. What plays a bigger role is the economics behind it, right? What are the things that a farmer has available? Are the land, the equipment and the skill levels easier to transfer? Health and safety are much lesser variables in the decision process about whether or not they are going to do this transfer.

People make health and safety decisions about their actions every day, but when you look at it from the strategic perspective of what type of job someone will be doing, I don’t think safety plays as much of a role. There are certain jobs that have a level of risk associated with them, and being in agriculture is a risk. Once you’re in it, I don’t think health and safety play much of a decision in what area of agriculture you enter.”



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In what ways can the hazards themselves be diminished as opposed to implementing these precautions?

“You can take any specific operation and see where the risks are and implement change. When you are looking at risk, you can minimize exposure so you’re doing something less. You can remove the hazard of something you’re not doing anymore altogether. Maybe you contract it out for someone else to do so you’re not involved in that risky operation, or you can change the process of what it is that you are doing.

When you’re talking about the production and harvesting of perennial grasses, they are actually a lower risk than the more traditional crop

approach. Again, based on what we understand, part of it is that we removed exposure. How do we come up with that? One of the biggest differences between perennials and traditional crops is that you have much less exposure time on operations that can be dangerous.

This is just an example, but when you plant a perennial grass, you do it one every ten-year cycle, maybe twice if you have to replant some if it didn't take. In a traditional crop, you're planting every year, so there is that planting difference in exposure. You have exposure once every ten years in one area, and you have ten exposures to risk every ten years in another. The fact you are being exposed more (in traditional cropping) gives you a higher risk of being injured."

Does your research support the conclusion that using custom harvesting contractors reduces the risks to producers?

"I guess I would say that it was not necessarily the purpose of my research. Academically, this statement would hold true because custom contractors are typically more skilled in the singular activity of custom harvesting. It's kind of a double-edged sword. They have more experience because of the repetitive nature of doing the same task over and over again. They probably have a very unique set of equipment that is fine-tuned for the operation that they are doing, but at the same time, they're performing an operation more often than most other individuals. If you look at the flip side, however, a person who doesn't do it on a regular basis doesn't have that vast experience. They may not have all of the best or the most effective equipment to handle the job safely, so they're making do with certain types of equipment that creates other types of hazards."

What is the most interesting or most important facet of your research that you want the general public to know and understand?

"For me, the best part is having that comparative analysis process that allows us to work with data that is less detailed than what we would like to see, and it gives us greater ability to forecast things. Does the general public need to know that? It has a benefit, but probably not. What's relevant to the general population is understanding that all of the decisions we make have an impact on our potential of being injured or causing injury. It's a matter of understanding that we don't realize that the decisions we make can have an impact on our health and safety."

How will you take your experience with CenUSA and put it to use in other research projects?

"It probably was one of the largest group projects I've ever had. I've had big ones, but this is by far the biggest. I think that for me, the experiences from the intense communication and coordination efforts are what I deem a success in this project. Something that I will probably walk away with is making sure that you use all types of communication when you are in a project. Anne Kinzel was always communicating and sharing information with us. We had the group meetings. All of the various communication efforts were extremely valuable for moving things forward.

Right now, my newest project is looking at how to reduce mortality rates of victims trapped in grain materials. That is not necessarily directly related to the CenUSA project. I guess what I get from it is that in CenUSA, we had a good group with members who communicated well, and we had a diversity of teams that shared ideas.

I think these things help in any project. I guess that's what I'm taking from CenUSA to the projects on which I am working moving forward."

Chuck Schwab CenUSA Bioenergy Work Product

Extension and Outreach

- ✓ Research Summary: Overview of Comparative Injury Risk Between Annual Corn and Perennial Switchgrass Production. Saxon Ryan, **Charles Schwab** & Mark Hanna, Iowa State Univ. (2017). https://cenusa.iastate.edu/files/cenusa_2019_034.pdf
- ✓ Fact Sheet: Master Gardeners' Safety Precautions for Handling, Applying and Storing Biochar. **Charles Schwab** & Mark Hanna, Iowa State Univ. 2102. https://cenusa.iastate.edu/files/cenusa_2019_023.pdf

Publications

- ✓ Moore, K.J., S. Birrell, R.C. Brown, M.D. Casler, J.E. Euken, H.M. Hanna, D.J. Hayes, J.D. Hill, K.L. Jacobs, C.L. Kling, D. Laird, R.B. Mitchell, P.T. Murphy, D.R. Raman, **C.V. Schwab**, K.J. Shinners, K.P. Vogel, J.J. Volenec. 2014. Midwest Vision for Sustainable Fuel Production. Biofuels 5(6): 687-702. doi: 10.1080/17597269.2015.1015312.
- ✓ Ryan, S. J., **C. V. Schwab** & G. A. Mosher. 2015. Agricultural Risk: Development of a probabilistic risk assessment model for measurement of the difference in risk of corn and biofuel switchgrass farming systems. International Society for Agriculture Safety and Health. International Meeting Normal, Illinois. ISASH Paper No. 15-01. ISASH Urbana, IL 61801.
- ✓ Ryan, S. J., **C. V. Schwab** & G. A. Mosher. 2017. Agricultural worker injury comparative risk assessment methodology: Assessing corn and biofuel switchgrass production systems. ASABE J. Ag. Safety & Health. 23(3): 219-235. doi: 10.13031/jash.12245.
- ✓ Schaufler, D. H., A.M. Yoder, D.J. Murphy, **C.V. Schwab** & A. F. Dehart. 2014. Safety and health hazards in on-farm biomass production and processing. J. Ag. Safety & Health 20(4): 283-299. doi: 10.13031/jash.20.10639.
- ✓ Yoder, A. M., **C. V. Schwab**, P. Gunderson & D. J. Murphy. 2014. Safety and health in biomass production, transportation and storage. J. Agromedicine. 19: 83-86. doi: 10.1080/1059924X.2014.886539.

Learn more about CenUSA at www.cenusa.iastate.edu

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