



USSA Podcast: Episode 5 Show Notes

Soil health

Episode five of 'This Is U.S. Sustainability' from the U.S. Sustainability Alliance focuses on soil health.

[Russell Goldsmith](#) was joined by Barry Evans, a cotton farmer from Texas, who spoke about his pioneering approach to dryland farming and Amy Bruch, an organic farmer from Nebraska, who discussed her soil health philosophy and the practices she uses to ensure her land is as sustainable and profitable as possible.

Russell also spoke to [Professor Michelle Wander](#), a soil scientist and professor at the [University of Illinois](#), where she is the director of the Agroecology and Sustainable Agriculture Program. Her entire career has been dedicated to understanding soil stewardship. Michelle said that she started out working on international agricultural development and looking at the use of legumes because they fix nitrogen and how to actually improve the association between rhizobia and legumes so that it worked well around the world. At the University of Illinois, she studies soil management by working in lots of different places, getting experience in different farming systems, different soils, with diverse cropping systems, and she has come to appreciate the challenge of different farming systems and stewardship. She explained that she has worked on various kinds of frameworks including the U.S. Sustainable Agriculture Standard that is an ANSI standard and connected to the trade association framework. She said that it is interesting to think about how to develop sustainability frameworks that work well for diverse kinds of farms and farmers with different challenges facing them.

Michelle explained that when she has worked on case studies with farmers, she has looked to understand their constraints and their management philosophies. She has seen where people have worked out tactics to navigate their issues to help them be mindful, and then how they often set up systems. She said she is a systems ecologist and thinks of agriculture as one of the most fascinating and challenging systems to study.

In conversation with cotton farmer Barry Evans

Barry was named [2021 Farmer of the Year by Field to Market](#), recognized for outstanding conservation efforts on his farm and leadership in advancing sustainable agriculture. Barry explained that he's from the Panhandle of Texas, in the northwest region, and it's called the high plains of Texas because they're at a high-altitude of 1,100 metres. He lives in a semi-arid area, which can be found on a map between Amarillo and Lubbock, and they have cool nights and hot days because of the altitude.



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Barry moved back to the farm in 1992 after he graduated from college and had worked in the industry for eight years. He grows cotton, grain sorghum and wheat and has about 1,400 hectares (3,460 acres) of land.

The farm is family-run. Barry is the third generation; his son is the fourth and is expecting his first child in January and Barry hopes he loves the farm as much as they do.

Barry described his wife as a city girl. He told a story of a day when they had just moved to the farm and as they were coming out of church, she pointed out that the dirt was blowing outside. He said he dismissed her even though he knew better but ultimately, she was right. He immediately went out to the field and got on a tractor to run what is called a rotary hoe to help break the crust, but at that point it was too late and their crop had been lost within 30 minutes. He said from then on, he decided that there had to be a better way to do things. They then took steps to prevent soil erosion and the measures have worked out well for their conservation and water efforts and it has been a really good success story.

Barry explained that they are located in the heart of the Dust Bowl, which was one of the largest environmental disasters to hit the United States, so he's very aware of dirt storms and doesn't want to make any mistakes again. He said that they are doing a really good job, especially with water irrigation. They pump irrigation water out of the Ogallala aquifer, which is about 450,000 square kilometres and stretches from South Dakota down to West Central Texas. It's essentially a non-replenishing aquifer which has been pumped since the 1920's or 1930's, and after World War Two, in the 1950's, irrigation really took off. Since that time, they've seen a massive decline in the aquifers on their farm. When Barry moved back in 1992, the land was about 80% irrigated and today it's 14% irrigated, so a large part of his conservation efforts is driven by the decline in the aquifer. Otherwise, how do they make a living, remain profitable and sustainable without the irrigation water?

No-till cultivation

Barry said the significant change for his farm was starting to use no-till farming, which means not plowing the ground. This goes against the grain of most farmers because they all like to run a tractor. He rotates the grain sorghum, or wheat with cotton, as cotton is a very drought-tolerant crop. It is good in a semi-arid climate because it can withstand heat and dry weather due to its deep taproots. Grain sorghum is also a very drought-tolerant crop and is known as a water-sipping crop because it has a more fibrous root system and puts out more organic matter. He said the cotton is more profitable than the



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grain sorghum but the grain sorghum makes the cotton more profitable, so they work in tandem and it is a good start in terms of what they can do on the farm without irrigation water.

The major advantage with sorghum, Barry explained, is having organic matter, which does two different things. Just like when you mulch a garden, whenever the rain falls it hits that trash and it helps break up the rain drops. When rain falls rapidly and just hits bare ground, it really sears that ground off whereas if you have organic matter or trash on top of the ground, it breaks that rainfall and helps the water infiltration rate considerably over conventionally tilled ground. And also, Barry says that through no-till he doesn't run water off the field to the same extent, which helps to hold nutrients in the soil rather than washing them off. Also, plowing the ground actually plows out moisture every time. No-till conserves the water that's in the ground and helps capture more rainfall and infiltrate, which helps the wind erosion and water erosion, so it's a win-win.

GMOs and LEPA

Barry said that GMO crops really made no-till work for him, and added that weed control is a big issue. If you don't control weeds, you don't make a crop at all, so GM technology helped him a lot with that. Other technology that has proved to be a real game changer is Low Energy Precision Application or LEPA; instead of spraying the water out on the ground they just bubble it in a small area between the rows of crops. This enables them to achieve about 97% water use efficiency on the farm.

Barry explained that he tries to remember that as a farmer, if you take care of the land, the land will take care of you. He said there are people that ask him all the time about the trade-off between economics and environment but he has found that the opposite is true. If he uses good environmental practices and takes care of the land then he makes more money and it's better economically. He said there's no trade-off and the land is their future. Any farmer wants to take care of their land and make it better for the next generation, he concluded.

Prof. Michelle Wander comments on the Barry Evans interview

Michelle said it was really nice to hear about Barry's commitment to his multi-generational farm and that his commitment is connected to the desire to have that land maintained by the family into the future. She said that Barry's comments about crusting and original observation of wind erosion were really telling about the challenges he faces, and his strategy to protect soil and water conservation was really interesting. She pointed out that he is managing those challenges very well and it was wonderful to hear him mention particular aspects of his system design, which included rotating crops that had different rooting characteristics and strategies.



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Michelle said that she could hear that Barry is a more advanced kind of designer within his system. He mentioned that important tactics for him have been the use of no-till, which is something that she's seen with a lot of growers. She can appreciate that in the last couple of decades, there is much more improved equipment available that does a better job for farmers and resolves many of the original early constraints with no-till. Barry also talked about his use of GMOs; this is an important technology for him because he doesn't have to kill weeds, which allows him to keep residues on the surface. She said that she would like to highlight the fact that when talking about erosion, people often think we're referring to water erosion, and Barry did mention that. But increasingly everywhere, especially where she lives and works in Illinois, they are experiencing periods of significant drying as well as a lot of soil movement and soil loss due to wind erosion. So, Barry's managing both challenges; he's caught between a wind erosion and a water erosion problem and talked about reducing his reliance on irrigation and increasing his water efficiency. She added that for him and his constraints, those are fantastic metrics of successful stewardship.

In conversation with organic farmer Amy Bruch

Russell was then joined online by Amy Bruch, The Organic Trade Association's [Organic Farmer of the Year](#).

Amy is a sixth-generation farmer from east central Nebraska. Amy said that early on she developed a great passion for farming thanks to her father, and she also loves math and science. She graduated with a degree in ag engineering and worked in industry for a little while and met her husband at college, in agronomy class. She said she partnered up with him and then they were in Brazil for about six years doing production ag. They were able to get into different consulting projects in South America and some other countries and continents, which was really exciting because of her huge love for agriculture.

Amy said that her father passed away suddenly, which prompted her to come back to the family farm. She had always wanted to farm with her dad and now she and her husband are farming for him. Once she was back on the farm, Amy said that they converted all their farmland to organic production, which is an exciting change, and they always look to continuously learn and do different things. She added that it's all irrigated as well. They are in a part of Nebraska that means they can access irrigation water. The crops they grow on their farm include food-grade corn; they grow white and blue corn for chips and tortillas. They also grow soybeans for tofu markets, and small grains, wheat and barley and alfalfa field peas. She said they really like to add diversity to their farm with their crops.



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Amy's family farm is called [Cyclone Farms](#) and is nearing the 2,500-acre mark. She said that they love managing it and getting additional people involved in the operations. She said they have an excellent group of people, and their team is wonderful, contributing every day to the mission of their family farm.

Soil balancing and the Albrecht McKinsey method

Amy said that as a farmer and also an organic farmer, soil health and soil balancing is basically her number one defense against all plant stresses, which can be insects, drought or disease. Having that soil balance is really critical to help mitigate some of those challenges. She follows the Albrecht Kinsey method, the overarching principles of which are 'feed the soil and let the soil feed the plant'. They look at breaking down soil balancing into the physical structure, the chemical structure and the biological structure. All three aspects are incredibly important, so she said they spend a lot of time in soil classes in the offseason, learning about different ways to efficiently balance the soil in those three areas.

Amy explained that they take annual soil samples and use an electric conductivity sled, which enables them to understand the different polygons and different regions of the soil types versus just looking at their soil like a checkerboard. Then, once they have the individual soil analysis from those polygons, they're able to precisely apply the nutrients more efficiently and effectively. She said they're not only balancing the macro-nutrients, but they're also looking at the next round, which is the micro-nutrient balance as well as trace elements. Their goal is to try and put the right nutrients in the right spot to drive that ultimate balance. They look at it from a bigger picture, where if the soil is healthy then it can mitigate some of these stresses. She explained that soil is like the human body - if a body is healthy, then it will be a little bit more resilient against the stresses of life.

Zone sampling

Amy talked about zone sampling, which enables them to achieve the polygons of the soil. They do this through zone sampling due to the irregular shape of the soil in the field – it's not necessarily in a checkerboard pattern. There are just a handful of different polygons in their soil and when they are getting their samples, it's a reduced number that they must pull. So, economically they can zone sample every year to get the pulse point of their entire field annually. Then they fine tune the soil balance and chart it out, looking at where they're going and where they've been to see the incremental improvement.

She said the Ogallala aquifer is a tremendous underground body of water, which means they can supplement some of the deficiency they may get with rainfall, but primarily they rely on rainfall in their area. They have irrigation systems, mostly center pivots to deploy the right amount of water to the right



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spot and have soil moisture probes to give them the intelligence to do that so they don't overwater. One thing about the aquifer in their area, while it's a tremendous size and body of underground water, over the past two years they have been able to regenerate about four inches of additional water into the aquifer. She explained that it's not something that's constantly going down in their area but has been on the rise over the past few years.

Amy finished by saying that soil health is truly the common denominator in all of the work that she does (on the farm and through her consulting business), and it has allowed her and her husband to work in many different areas, such as Brazil, where the soil was bright red and had a pH of four. A more recent project they worked on involved converting a citrus grove that had recently died from citrus greening into a corn silage for local dairies, which was more of a revitalization community project, and that soil had a pH of eight. She said there are different tactics and techniques that they leverage in order to bring the soil back to an equilibrium. The Kinsey Albrecht method allows them to do that and is really the common denominator. She said they're looking at **intentional soil balancing** and it has taken them on a journey across the world and brought them back to her hometown. She said she couldn't stress enough the importance of intentionally balancing the soil, knowing what you're trying to get and working towards that goal. In terms of agriculture, there are many ways to farm, Amy added, but continuous improvement and always trying to learn something new every day has proved to be successful for her on her farms and in her life. Realizing that there isn't one way to do something and that you can't always directly apply what you learn on somebody's farm, it may need to be tweaked. But having that conversation, sharing information, the trial and error and innovation, helps to improve agriculture and make it long-lasting for the next generation.

Prof. Michelle Wander comments on the Amy Bruch interview

Michelle said that Amy's interview was really interesting because she is often asked about soil balancing in her own work, and it's slightly controversial or has been with some people who haven't found it to be useful. She explained that she has worked with, interviewed and studied people who are following the Albrecht Kinsey method and has found that some of them are really master farmers when they're thoughtfully applying those tactics. They've drilled down to work in a very nuanced way for very particular cropping systems and she had noticed that in Amy's (and also Barry's) thinking; both are managing a particular resource and constraint.



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Michelle said that it sounds as if Amy has had the opportunity to work in different soil systems to appreciate how to stack up problems in different ways and different locales. For Amy's farm, it's clear that she's using a classic rotation of crops, which is a tactic that's used to break disease, pest cycles and build soil fertility. The legumes she uses in her system, Michelle continued, are really important, and she spoke about testing every single year, which is unusual. A lot of farmers don't test every year because they don't apply fertilizer every year. They might fertilize in front of their most heavy-feeding crop but she senses that for them to test every year, they are really thinking about different nutrient demands of different crops, which vary.

Michelle said that rotation includes waxing and waning of stocks of different nutrients based on the different kinds of crops. This is something that both Amy and Barry are doing - they're both managing and thinking about the different phases of their rotation. She said Amy talked about managing macro-nutrients and micro-nutrients for extremely high-value systems, where they're getting very high yields, which would be the case for irrigated land. In many ways, Michelle said, farmers look for irrigated lands because they can manage water and prevent water stress, they tend to be the highest yielding and lend themselves to very high precision management.

Zone sampling

Michelle mentioned how Amy is practicing precision management with zone sampling, using electrical conductivity to delineate regions that would need more or less nutrients. This is indicative of high-end management. Michelle noted that she didn't hear about any problems from Amy, although she did note that they were relying on the aquifer and center pivot irrigation, which is not precision irrigation. Michelle suspects that they may move to that, although Amy didn't show any signs of feeling water constrained. She added that when we look at how both Amy and Barry are farming in the high plains, and that whole area is facing water limitation and will do so more and more, it was interesting to see the difference between the two and their attitudes about water.

Michelle explained that it's important to share these farmers stories and both are a nice pairing in a way as they have some things in common and things that are very different. There are lots of diverse kinds of farming systems and farm operations that use different tactics to help them both verify and demonstrate to the consumer and the public that they are using good practices, and we see Barry and Amy receiving awards from two very different organizations, she added. The Field to Market system helps people in the food and value chain audit their stewardship and focuses mainly on environmental performance, but it does have some social dimensions with labor provisions included. And by engaging in that, it's helpful to Barry not only to confirm or communicate to the public his intent and compliance



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with a certain set of standards. It also helps him keep track and over time do better and better by being in a learning community, and the same is true for Amy. She's certified through the organic standards and through consulting, so that's two tethers she's using to help her be reflective and track and report what she's doing, which ties both farmers to a very grounded place. This is very common for people who own and manage land that are individual family farms and multi-generational farms, Michelle added. Those are the things that have stood out to her, to track and respect people's efforts to be grounded in a place, to have that not only be successful now but also successful in the future.