USSA Podcast: Episode 3 Show Notes

In this episode, we put innovation and technology under the microscope, looking at differing approaches between the U.S. and Europe and how technology could play a major role in sustainable food production, particularly in Europe's so-called 'Farm to Fork' strategy.

For the main discussion, we were joined from Paris by Marie-Cécile Damave, Head of Innovation and International Affairs at the Think Tank, agridées, and from Washington DC was Benno van der Laan. Benno is an expert in government relations and issues management who has worked with American farm groups for more than 25 years on international market access issues associated with agricultural technologies.

During the show, we also heard from two U.S. farmers about their use of technology: soybean farmer Monte Petersen from North Dakota, a strong advocate for GMOs, and wheat farmer Peter Hvidsten, who is based in Northwest Minnesota and who shared his experiences of precision ag and other technology innovations on his farm.

agridées

Marie-Cécile explained that agridées is probably the oldest think tank in agriculture in France, created in 1867 by farmers, for farmers. Marie-Cécile is an expert in technological innovations with an international perspective. She's worked with agridées for eight years, and before that she used to work for USDA in the American Embassy in Paris, where she was a market analyst. agridées is a small team of less than ten experts; they try to engage and share reflections and recommendations on strategic issues to help decision makers seize opportunities to address the challenges of the 21st century. This is not only in terms of food security, but also, fighting against climate change and very importantly, meeting consumer demands and trying to bridge the gap between producers and consumers.

View of European farmers and technology

Marie-Cécile believes that most European farmers are really enthusiastic about technology and already use a number of innovations on their farms. Agriculture has always adopted innovations; machinery and equipment, for example, and farmers are well equipped, both in animal production and plant production, crops, fruits, and vegetable production. Also, for the past 10 years, the development of digital technologies has been really significant in Europe. There are some countries, including France,

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Germany and the Netherlands, that are really adopting digital technologies to make agriculture more precise. The difficulty now for farmers is to choose the right service and the right company that is the most adapted to their own situation because the supply is so large. So, there are actually a number of opportunities to seize so that farming can really change in Europe and be more adapted to consumer needs. Consumers are no longer only consumers, but also citizens who make choices according to their values when they purchase food. It's important that farmers have access to technologies in order to respond to these demands.

Benno added that farmers, no matter where in the world they operate, often have the same perspective on this. They want to have access to the best tools available. They want to improve their yields and improve the quality of their crop while taking care of the land, which in most cases they have inherited, it has been in their family for generations. And when there are differences, they are often the result of politics and different policies. In the US, though, Benno thinks society has traditionally been a bit more open to innovation and both the general population and farmers tend to have trust in the institutions. For example, when the FDA declares that a new technology is safe and farmers see that it is effective, they will endorse it, whereas perhaps in the EU, this is less the case. Talking about the policy side, the EU uses the precautionary principle, and also has an approach to regulation which is based on the process by which a product is produced. In the U.S. there is a tendency to look at the characteristics and the use of those products. So, in that sense, there are differences. But on the whole, farmers are looking to continuously improve.

Marie-Cécile agreed and added that farmers all over the world talk the same language. Generating value is their number one objective, generating economic value, of course, but also societal and environmental value, meaning being sustainable. The trust issue that Benno raised is very important, but it's also about trust in the industry, trust in farming and it's really something that needs to be worked on between farmers on one side and consumers on the other side, Marie-Cécile added. Building back trust in this chain in the food chain is very important and technology is important to build it back.

GMOs

Benno explained that specific technologies such as GMOs are where there have been differences. The EU has had a reluctant attitude towards GMOs ever since the technology was introduced. There are some contradictions here. On the one hand, the EU has been very restrictive in cultivating GMOs. But on the other hand, it has approved many GMOs for import processing and for use in food and feed over the

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years. There are more than 100 GM crop events that have been adopted by the EU. And actually, it imports large quantities of GM soy, for example, every year, more than 30 million tons. So, that really highlights the point that the issue is not so much about safety, it's more about acceptance and the politics around that, which have been more problematic in the EU.

Marie-Cécile said that this is a major issue where there is difference between the U.S. and the EU, but she doesn't think farmers are that different. If European farmers were allowed to grow GMO crops, they would grow them and in fact, they did in the past. When one GM corn was authorized for cultivation in France, it was grown, and it was actually pretty successful among French corn growers. Since then, they have not been authorized to grow it, so they don't grow it, and they have found other ways to fight against the pest which the variety was targeted at. So, farmers are pragmatic. They know what they need to fight against or what they need to work with. They use what is offered to them at the best price. Marie-Cécile thinks that a point that is important to make is that farmers are no longer isolated as one segment of the food chain. They are really integrated into the food chain and are responsible for their production, the way that they produce things, according to the specifications that are made across the food chain, by their customers and the food industry. They need to comply with that. So, if one of their customers wants zero GMOs, then they will of course use zero GMOs. If they want them to reduce the amount of pesticide residues, then they will have to adapt their practices accordingly. And then they will have to communicate around that and make public the responsible and sustainable farming that they do upstream so that the downstream stakeholders are aware of it and so that they can earn money from it.

Farm to Fork

Marie-Cécile believes that the Farm to Fork strategy sets objectives and that it needs to be a lever for developing new technologies to reach these objectives rather than being an incentive to stop using some solutions. The objectives of the Farm to Fork strategy are mainly to reduce chemicals, reduce fertilizers, reduce chemical pesticides that are used in agriculture, antibiotics and develop organic agriculture. If you look at all that, it means more constraints than initiatives to bring in new solutions. But she thinks and hopes that what the people in the European Commission have at the back of their mind is the fact that these objectives cannot be reached without the help of other technologies that are, for example, digital farming, or genetics. Whatever breeding techniques that are used, for example, bio pesticide solutions, bio stimulants, anything that is new, that is innovative and that can stimulate plant growth and really protect plants against stresses like lack of water, like very high temperature, like health, anything. And there are many innovations along these lines that are popping up everywhere

these days, but maybe regulation is not pushing them to the market. There are many innovations that, for example, protect grapevines from the damage of hail or frost. There are plant breeding techniques that are used to increase the drought tolerance of some plants. But the European Union is still hesitating between classifying these new breeding techniques as GMOs or not. So, if the European authorities want to reduce the use of chemicals in farming, then some alternatives will have to be introduced and favored by policy makers so that farming in Europe can continue to meet food security goals and continue to feed European people in a sustainable way. Otherwise, the EU will have to import more food. Marie-Cécile doubts this is an objective of the European authorities because Europe is currently a major exporter of food in the world, number one with the U.S.

Benno added that the Farm to Fork strategy is almost a perfect example of the way that the EU tries to achieve an objective. We all want to make agriculture and food more sustainable; we need to reduce CO2 emissions. Secretary Vilsack has recently made comments to that effect. The problem often is that these goals are very ambitious, they're almost always aspirational. They're often harder to achieve because of realities on the ground, and they're often prescriptive in terms of regulation and the targets are often arbitrary. For example, in Farm to Fork there is a goal to reduce the use and risk of pesticides by 50% by 2030. Why 50%? It's not really very clear, Benno says. And interestingly, in recent weeks, several studies have been published that all point to the same conclusion with respect to the likely impact of the Farm to Fork strategy, and that is lower production in the EU, lower income for farmers in the EU, higher prices for food and a shift of CO2 emissions to outside the EU, so if implemented, CO2 emissions in the EU would go down. But because the EU would have to import more food as Marie-Cécile said, it might go from being a net exporter to becoming a net importer. The global CO2 emissions are not likely to go down, so the EU itself has not really done an impact assessment yet. There's one other aspect with the Farm to Fork strategy; the EU has been very clear that it realizes this is going to have an impact on European farmers. By using the level playing field idea, being able to continue to compete with producers around the world, the EU has been saying that all imports into the EU need to meet European standards, and that may be acceptable. There is an external aspect with respect to the Farm to Form strategy, Benno added. The implementation of it may have an impact on imports into the EU and it may have an impact on the way food is produced outside of the EU. This is likely to become a serious point of discussion in the years to come.

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Interview with Monte Peterson

Monte is a director of both the American Soybean Association and the U.S. Soybean Export Council, which is a founding member of the U.S. Sustainability Alliance.

Monte explained that he comes from the southeast corner of North Dakota. He is a fourth-generation farmer, currently with a farm of about 1,620 (4,000 acres) hectares of corn and soybean. He's following in the footsteps of his great grandfather, his grandfather, and his father before him. In fact, he lives in the same house that he grew up in and that his father also lived in. They farm in the very same area that his great grandfather immigrated to back in the 1880s. So, production agriculture has been a part of their family for a long time.

Genetically modified crops or genetically modified hybrids, cultivars and varieties have been part of Monte's farm operation for quite a few years, not exclusively over the entire farm, but they utilize them where they see a benefit.

Back in the 1990s, Monte said that they were experiencing a problem with the corn borer – the moth takes flight during a pollination period of corn and can be quite devastating to yield, chewing on the silks of the ear and causing problems with the pollination of the corn. Monte explained that you therefore don't fill out the ears the way that you should. Their management practice back in those days was to try and monitor the flight of the corn borer and to time insecticide applications to help control those pests, which was challenging.

Quite often they would need to apply insecticides more than once because they were unsuccessful on the timing the first time. Monte thinks that one of his main concerns with applying insecticides is the safety to himself and to the others that help him on the farm. There's a concern of just exposing insecticide, spraying them on, fogging them over a crop and what that's doing for the environment. But nevertheless, the corn borer was doing some significant damage and would often rob them of 20, 30, 40 bushels of yield per acre. So, when the first Bt event came - genetically modified seed that addressed the corn borer – they studied it for a couple of years, and it was two, three years before ever a variety with that Bt event was produced to work in their latitude. When they did have the opportunity to try it, they did so on a very small-scale side by side with the conventional corns that they were used to using in the field to do some testing.

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That also coincided with a time when they were starting to implement in a more serious fashion some of the precision technology that they continue to use today.

They installed yield monitors on their combine harvesters, installed global positioning systems - satellite receiving systems - so that they could record yield as they were harvesting and know exactly what the yield was in a particular area of the field. That was beneficial because they were trying not only that new technology, but also starting to experiment with different cultivars and the inclusion of this GMO event in this one particular variety, to see how it addressed the problem that they were having with the corn borer.

Monte explained that it didn't take long to realize that the GMOs had a significant impact, not only in controlling the pest but also, they were producing more yield, growing healthier plants throughout the growing season without the interruption of a pest that was curbing yield and the health of the plant. He said more importantly than anything else, there was the safety component that they felt personally by not having to try and time these insecticide applications. That was the very first experience he had with GMO back in the 1990s. The second experience was with soybeans, three years later (when they first introduced glyphosate-tolerant soybeans). Their experience started down that path with the glyphosate-tolerant soybean variety and, over time, they had access to more varieties that were more suitable for their latitude, and it's something they continue to use today.

Monte explained that their use of GMOs was just the beginning of the opportunity to become much more sustainable on the farm because it affected a lot of different things. The number of trips that they made over the farm, using less fuel, conserving soil in a better way, they could control weeds without tillage. As time passed, they saw much better design and equipment.

Impact of Precision Ag

Monte explained that every little thing, some way or another, seems to have some slight impact. It's a combination of all of these technologies that makes it easier to be sustainable today. He said that machine control and auto-guidance have created this foundation, and the ability to precisely apply exactly what's needed, where it's needed, when it's needed, means that there isn't the waste that there was in years past.

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The decision process when introducing new technology onto the farm

Monte said firstly when introducing new technologies, they think 'does it have a fit for us?' 'Can we utilize it on the farm?' Is it not only economically sustainable, but 'is it environmentally sustainable?'. His number one asset is the land, and the number one priority is to leave this land in better shape for the next generation. They pan through a lot of university trials, decide how the application might work on the farm and go from there.

He explained they have the good fortune of having some very stringent research prerogatives that they look at. The utilization, the safety of it; any decision they make has to be based on sound science and has to have a fit for the farm.

Educate those outside the farming community

Monte explained that as generations go on, we've become further and further removed from the farm. There's no question that consolidation has occurred across production agriculture but it's important for each of us as consumers to follow sound science, reach out to those that are in production agriculture, ask questions and learn about how our food is made today or gain a better understanding of what all that entails.

U.S. vs European approaches to technology and innovation in farming

Marie-Cécile said that listening to Monte was really interesting and she picked up some of the technological innovations that he mentioned on his farm, including GMOs, precision agriculture, GPS tracking, satellite imagery, climate and weather stations, auto guidance. To her, everything apart from GMOs is comparable to what's going on in Europe. The auto guidance, the GPS – she thinks this is really a revolution for farmers in Europe, as it is the in the U.S. It makes their lives easier. It makes farming more precise, it saves time in terms of workload, etc. Referring to Monte's comments on soil conservation impact, the soil quality, the fact that fuel consumption was reduced using GMOs, she said that this is something that European farmers cannot enjoy thanks to GMOs, but they have other means to do that - some of their objectives are to reduce their greenhouse gas emissions, including through machinery and equipment. So, they do whatever they can to reduce that. Also, to limit the emissions of other greenhouse gases, especially from nitrogen use.

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Marie-Cécile explained that the soil conservation, the improvement of the organic matter in soil, is really a strong objective in Europe, especially France where they launched the 4 per 1,000 initiative a few years ago, which aims to store carbon in soil, in order to partially compensate for the emissions of greenhouse gasses. She said that France has set pretty ambitious objectives – the expression that is used is 'carbon farming' – so they find ways for farming to increase the carbon storage in soils or in the plant roots. Forestry is very much involved in that as well. Therefore, she thinks that in the U.S. and in Europe, the objectives are shared of reducing the impact of agriculture on climate change through the reduction of greenhouse gas emissions. Also, carbon storage or carbon sequestration in the longer term. But the tools that are used to reach these objectives are not always the same, especially with the GMO aspect.

Benno thought Monte gave an excellent overview of the economic, social and environmental benefits of using biotechnology on his farm. He added that no matter which farmer you speak to in the U.S., they will all say the same thing. What we have seen over the last 25 years is that an ever-growing portion of farmers have been adopting this technology on their farm, he said. They see that it works, and now more than 90% of soybean and corn farmers grow GM crops, and they have been doing so for many years. This view is shared by farmers throughout the Western Hemisphere with similar adoption rates of GMOs in countries like Brazil, Argentina, Paraguay. What is interesting is that today there are 29 countries around the world that cultivate GM crops, about 42 countries import GM crops and most of the expansion in acreage of GM cultivation is now happening in developing countries.

Marie-Cécile said that there's a paradox when you look at what the EU is doing in terms of GMOs, banning cultivation but authorizing huge amounts of imports, especially for animal feed. It's a difficult thing to understand, she said. There's a specific, complicated regulation around GMOs in Europe. It's a different regulation for imports and for cultivation. In the end, she thinks it reflects that in fact, the EU does not grow enough feed to feed its animals. And the EU is a major producer of meat worldwide, has a big herd of livestock and poultry and really needs to import a big share of the animal feed, just to feed its animals because it cannot produce enough by itself, especially corn and soybean. The protein need in Europe is huge and there have been various protein plans announced over the years by the European authorities - without any significant impacts - to increase the domestic production of plant proteins to feed animals. Marie-Cécile thinks that we are seeing a shift to a diversification of plants to supply proteins to animals in Europe. But it's going very slowly and it's really difficult to substitute for soybeans because of the high quality and the price that is very competitive for this product on the market. She thinks the European market is maybe having an inward look at what's going on right now. Maybe a domestic market is developing with some specific commodities that are grown in Europe in order to

feed European animals. But she doesn't see 100% substitution for imported soybean and corn products. She added that there is also a decline in animal consumption in Europe, and in the developed world in general, which is actually the opposite trend that is going on in developing countries where animal products are being more and more consumed. But in Europe right now, the general long-term trend is for a reduction. So, it also means that the demand for animal feed would be on the decline.

Interview with Peter Hvidsten

Peter Hvidsten is a fifth-generation farmer based in Northwest Minnesota. His ancestors came over from southern Norway in the mid-1880s – his grandpa, Olaf Hvidsten. He is honored to be able to carry on the tradition after the four previous generations and represents the Minnesota Wheat Growers Association and the Minnesota Research and Promotion Council.

He graduated from North Dakota State University in 2004 with a degree in general agriculture, but it had a heavy emphasis on agronomy and soil science. He said he always had a passion in just learning about trials and different experiments, with fertilizer or seeding rates or different things like that.

Peter farms about 4,000 acres (just under 1,620 hectares) and his biggest crop is wheat but he also grows soybeans, corn, and edible beans, which would be navy beans, pinto beans and black beans. This year they also had a few acres of canola. He farms with his dad, Tim, who Peter said is two thirds retired. He helps out in the spring and the fall and with any advice that he needs. His wife, Kristen is part of the family farm and he has three daughters, Kate, Maddy and Ella, and hopes that perhaps one day one of the three at least would like to join the operation.

In 2018, his farm was recognized as a Minnesota 'century farm', which means that your farm family has owned a specific piece of land and operated it for more than 100 years.

Use of technology

Peter said that the use of technology in agriculture in particular has greatly advanced in the last two decades. One of the first major technologies that he adopted about 15 years ago was GPS autosteer, which allowed them to essentially have hands free steering when driving down the field and get accuracy into their planting, spraying, and tillage instead of overlapping when making passes and trying to drive as straight as they can, just with their hands steering. The machine helps eliminate some fuel

costs, fertilizer costs, some chemicals, and the overlap and just makes them more efficient with their time too. He said at least nine out of 10 farmers implement this to get started with that type of technology. It is fairly expensive to get invested into it, upwards of five to eight thousand dollars per machine to get started. But that cost gets made up quickly with efficiencies.

One of the next practices that Peter employed on the farm about 13-14 years ago was variable rate fertilizing. It's a technology that uses satellite lidar maps and also their harvest yield maps - a map guidance of sorts that helps determine which areas of their fields are most productive, which areas are medium productive, and which are the lowest productive. They take those and apply a higher rate of fertilizer to their higher productive areas and a little less to their lower productive areas. This maximizes yields on each of their acres and saves on inputs. So, they're putting less fertilizer down than a typical blanket prescription would be for each field. To put that in perspective, the previous week, Peter said he had a field they had soil tested and had a map made to apply some phosphorus for their soybean crop next year. It's a 70-acre field and the map showed that they only needed to apply 80 pounds of phosphorus for 16 of those 70 acres. So, they had 16 acres that they applied fertilizer for and 54 they did not. They ended up not using about 4,000 pounds of fertilizer. The cost right now per ton of phosphorus is about $750. So, they saved $1,500 right there and were able to maximize yields next year in their crops by not putting it where they don't need it and putting it where they do need it.

Sustainability

Peter said that fertilizing variable rate is maximizing profits on their farm and soil productivity as well. He said that on the farm, the two most important assets are employees and the soil. They have to nourish both in order to be as productive as they can. Maximizing fertilizer applications into their correct spots will definitely help sustainability of their soil. They are trying to implement reduced tillage too – reducing one or two passes of tillage per season brings two benefits. One is on the front end; their fuel bill is going down considerably. Every tillage pass costs about a half a gallon per acre. If they eliminate two passes over 4,000 acres, that's about 4,000 gallons of fuel that they're not using, which is a huge saving financially. Every tillage pass that they make also releases carbon into the air and that carbon is in with the soil to help build organic matter – which he sees as the engine of the soil. So that just helps feed the roots and feed the crop. Peter is hoping this practice will improve organic matter in the soil.

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Investment

Peter said they have to have a globe which receives the signal from the satellite on each machine and a used one costs from $1,500 to a new one, which is upwards of $8,000. They also have display inside of each tractor cab, which is essentially a computer touch screen, which vary anywhere from $3,000 to $10,000, depending on which technology is uses. So, in that respect, there is a minimum of probably $5,000 investment per machine, upwards of $12,000 to $15,000.

Peter said that with technology changing so fast, it is hard to stay ahead of it, probably near impossible, but you just can't do things the way they've been done in the past, just because that's the way they've been done. In terms of tillage, many farmers worked the field three times after harvest, that's just what they did. But they are finding out that that's probably not the best practice. He can save fuel and can help build his soil long term.

Peter doesn't ever want to waste one cent of his money on any investment or any input that's not necessary. So, like fertilizing, he doesn't put more than one pound extra than is needed on his soil because he doesn't need to waste money or spend that money on that, whether it's that or chemicals or anything, they are trying to be as efficient as they can in the resources they use. He used a cooking analogy - using an expensive ingredient like caviar. If a recipe calls for a teaspoon of caviar and you have another three teaspoons left in your jar, are you going to throw it all in just because you want to get rid of it? Or it's easy? No, Peter says, you're going to use what's called for, and that's the way he looks at farming. He is not going to do anything more than he needs to. He wants to be as efficient as he can be, and as sustainable as he can. He's looking to create the highest quality product that he can in the most efficient way possible. He said that's the way their farmers are in his area. It's just doing things the right way and the best way possible.

Future technology trends

Marie-Cécile thinks modulation is something going on that is a major trend - modulation meaning not applying the same quantity of fertilizer or not sowing at the same density, or not applying the same quantity of, say, fungicides on one big plot, but modulating according to the need of the plant, modulating according to the composition of the soil, things like that. So, for that, of course, farmers need to be well informed of the quality of the soil, of the type of weather, of the needs of the plant, etc. This is something that is developing right now. It's still small in France, but it's really developing with a

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number of software products on the market and companies that propose some diagnosis and also recommendations to improve that and to maximize yields and giving recommendations on what plant varieties are best adapted to certain conditions. She also thinks robotics is emerging. Most robots in France right now are milking robots and usually dairy farmers are really happy with them, especially in terms of workload. They almost never regret this investment. But the second type of robotics that is developing is for weeding, either mechanical weeding or chemical weeding, but precisely, meaning spot spraying, spraying the chemical where needed. This is based on artificial intelligence and imagery where the robot actually recognizes the weed and sprays chemicals specifically on the weed and not everywhere in the field. So, it's still emerging, it's mainly on small fields of vegetables, but it is growing, and she wouldn't be surprised if this would continue.

Benno added that we'll see more advances in precision agriculture with the use of satellite sensors and all the things that both Peter and Monte discussed. But he thinks we will also see continued progress in the seed technologies that farmers will have access to. In the area of GMOs, what we have already seen in the last few years is the development and approval of stacked events that combine several single events that are drought resistant, insect resistant and tolerant to several herbicides all at once. And that trend will continue, so we'll see more of that in the next few years. And then there is the area of gene editing where there is even greater potential. And in some countries, there are examples of crops that are already being grown using gene editing techniques. So that will probably accelerate in the next few years, Benno thinks.

Marie-Cécile added that she sees gene editing as part of precision agriculture because they are more precise that what was available in the past.

Finally, Marie-Cécile said that anyone interested in finding out more about agridées and its work can visit the website: www.agridees.com