May 17, 2016

Testimony of Tom Buman, CEO of Agren

For the House Agriculture Sub-Committee on Conservation and Forestry

Hearing Topic: Solutions through Voluntary and/or Locally Led Conservation Efforts

Chairman Thompson, Ranking Member Lujan Grisham, and Members of the Subcommittee, thank you for the opportunity to appear before the Subcommittee on Conservation and Forestry and to provide testimony regarding innovative solutions for conservation.

My name is Tom Buman. I was raised on a farm in Western Iowa, where my parents instilled in me a deep conviction for agriculture and the environment. Today, I am still connected to my family farm, which my brother operates.

For the past 20 years, I have been the CEO of Agren, where I have married my love of agriculture and the environment to my passion for pioneering innovative solutions to environmental problems. At Agren, I drive concept development and continuously challenge scientists, programmers and subject matter experts to achieve a higher level of innovation. I am also responsible for leading business development and strategic partnerships.

Prior to founding Agren in 1996, I spent 14 years with the Natural Resources Conservation Service in Iowa, first as a Soil Conservationist and later as a District Conservationist. I have a Bachelor of Science degree in Agronomy (1982) and a Masters in Business Administration (1995), both from Iowa State University.

I am proud to say that Agren's suite of precision conservation software is revolutionizing soil and water management. Our online conservation planning tools enable users to get done in minutes what farmers have traditionally waited on for weeks and months. Our customers can now offer practical, value-added soil and water management solutions, empowering farmers and land managers to make profitable decisions that ultimately enhance agricultural productivity and sustainability.

Let's just get it out there. We, in the farming community need to do more conservation. We need to up our game. What we are doing is simply not enough. But just as importantly as doing more, is doing more of the right thing. Yes, doing more and doing more of the right thing are completely different. It's no longer good enough for farmers to place a terrace or waterway, wherever they think it's needed. For farmers to make a significant impact on soil erosion and water quality, the conservation practice needs to be targeted for a specific purpose. And that is the challenge facing today's farmers; putting the right practice in the right place.

I'd like to use a simple health analogy to demonstrate my point. What if your doctor tells you that you have a high risk - 1 in 5 chances - of having a heart attack in the next 10 years? What would you do? You're now challenged with making some critical decisions. The research tells you that modifying certain risk factors can improve your odds. You probably have an idea what those risk factors are. Some are simple strategies, while others are more complex. You could exercise. You could cut saturated fat from your diet. You could lose weight. You could take daily baby aspirin or medication to lower cholesterol. You might even envision the need for surgery. A combination of life style change strategies might make a bigger difference, but you want to be sure. You want the best course of action for the best outcome, based on your current health and lifestyle. So you turn to an expert, your doctor, to distill the information and help you develop an individualized plan.

Farmers also want what works best for the health of their soil and the cleanliness of their water, as well as for their pocketbook. But they lack critical decision-making tools. Just as health decisions are driven by individual health information, today's conservation decisions should be based on individualized, site-specific resource concerns; an individualized plan to put the right practice, in the right place, for the right purpose. This precision conservation, like the practice of medicine, is an art and a science. With recent advances in innovative technology, combined with site-specific information and accessible technical assistance, farmers can do more to achieve the most environmental protection, for the lowest cost, while meeting the goals of their operation.

Let's examine the current status of accessible technical assistance. If we agree that farmers need technical assistance to interpret information, implement conservation and do more of the "right thing," we should ask ourselves, where do farmers get this help? Government? Probably not. Conservation agencies are tapped out. Funding for staff resources at both state and federal conservation planning agencies has been on a steady decline over the past 30 years. An astonishing 5000 full-time employees, approximately 33% of the total workforce, were cut from the NRCS budget between 1980 and 2016 (Helms, 2010) (Lawrence, 2015). But even if these numbers were restored, it will not make an appreciable difference to reaching enough farmers.

In the spring of 1981, I was a junior at Iowa State University studying agronomy. My dad had one of the first outbreaks of black cutworm in the neighborhood. What did he do? He did what every farmer did at that time. He called the Extension Service. The County Extension Agent came out to the farm, diagnosed the problem, held a field day for Dad and his neighbors, and helped Dad solve the problem. Today, unlike 1981, farmers take their agronomy questions straight to their ag retailer because farmers trust their ag retailer to give them sound advice.

The scale of solving the soil conservation and water quality issue is enormous and farmers should have the option to seek technical advice from professionals, whom they most trust. Given the magnitude of the need for technical assistance, the private sector is the only resource that can scale to the challenge.

Conservation through the Private Sector

Because the traditional stream of information and technical assistance has been constrained and because the private sector has improved their capacity, farmers turn to the private sector more often for information and advice. In their trusted role, ag retailers are positioned to be a farmer's first line of information on conservation issues. Furthermore, ag retailers are the only entity with the opportunity to deliver field scale agronomy, including conservation planning, to U.S. farmers.

Several studies demonstrate that farmers implicitly trust their ag retailer and have an appetite for their retailers to do more to protect natural resources. For example, a 2012 survey of 5,000 Midwestern corn producers reported their most trusted advisor, when making decisions about agricultural practices and strategies, was their chemical or seed dealer. As depicted in Figure 1, crop advisors came in a distant second, with conservation agencies, university extension, and non-governmental organizations trailing even further (Arbuckle J. , 2013). Further, a 2015 study of over 1,000 Iowa farmers found 60% agreeing that their fertilizer or ag chemical dealer "should do more to help farmers address nutrient losses into waterways." Only 9% of the farmers reported they did not think their ag retailer should provide conservation services (Arbuckle & Bates, 2015).

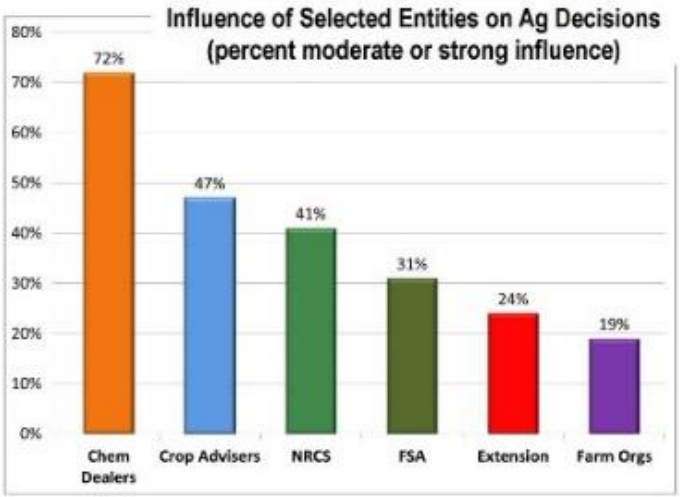

Figure 1: Chemical dealers top the list of ag's most trusted advisors.

Throughout the past two years, my colleagues and I have communicated with several of the largest precision agriculture providers. They have expressed an interest in, and in some cases excitement about, delivering conservation technical assistance.

An Example of a Private Sector Offering:

In an effort to get more conservation on the ground, United Suppliers, a customer-owned wholesale supplier of crop nutrients, crop protection inputs and seed, with headquarters in Ames, Iowa has stepped forward. United Suppliers is making a significant investment into developing a conservation planning service through the private sector. They have named their conservation platform SUSTAIN™. To my knowledge, this offering by United Suppliers is the single largest, private sector investment in soil conservation planning services offered to farmers.

The SUSTAIN™ service platform includes soil loss estimates and initial planning of conservation structures, including grassed waterways, water and sediment control basins, ponds, and wetlands. "The new conservation planning service will provide growers assistance in exploring conservation alternatives that best meet their needs," said United Suppliers President & CEO Brad Oelmann.

What a change. Even 5 years ago, it was difficult to imagine a major ag fertilizer/chemical dealer developing a platform with such a bold Vision Statement, *"improve the capabilities and competitiveness of United Suppliers' Owners by positioning them as leaders of the environmentally sustainable agriculture movement, both in the agriculture industry and in the communities they serve."* And following up with a Mission Statement of *"offering a leading-edge, economically sound and forward-thinking pathway through which Owners can deliver significant benefits for growers, and do so in ways that are good for the environment and meet the demands of the supply chain for fertilizer optimization and soil health."*

United Suppliers SUSTAIN™ Platform

Vision: *SUSTAIN will improve the capabilities and competitiveness of United Suppliers' Owners by positioning them as leaders of the environmentally sustainable agriculture movement, both in the agriculture industry and in the communities they serve".*

Mission: *SUSTAIN offers a leading-edge, economically sound and forward-thinking pathway through which Owners can deliver significant benefits for growers, and do so in ways that are good for the environment and meet the demands of the supply chain for fertilizer optimization and soil health".*

SUSTAIN™
ENVIRONMENTALLY SUSTAINABLE AGRICULTURE

To add to this excitement, in October of 2015, United Suppliers entered into a joint venture with WinField Solutions, the crop input business unit of Land O'Lakes, creating WinField US. A full merger of the two organizations will be completed in October of 2017. Precision soil and water management has emerged as a high-priority and best fit for the WinField US sustainability platform. WinField US believes that helping their growers conserve soil resources is essential for their productivity and profitability, as well as for the expanding global population. As a major first step, the organization's leadership is working to partner with the Minnesota Department of Agriculture to support farmer participation in the Minnesota Agricultural Water Quality Certification Program via the WinField US cooperative retail network.

Technology and Precision Conservation

Just like technology revolutionized precision agriculture, precision conservation will be accelerated with new, innovative technologies and approaches.

In 2006, Agren entered into the world of high tech software. With a Conservation Innovation Grant from NRCS we developed 2 software programs; one to design ponds and one to design sediment basins. The technology is amazing. What used to take me 6 to 20 hours, I could now do in 15 to 20 minutes.

However, we didn't stop there. We developed more software. We developed tools for wetlands, prescribed fire, and then one for grassed waterways.

Most recently, Agren worked with USDA's Agricultural Research Service (ARS) to commercialize some of their science and technology. Most people would refer to this as technology transfer; I call it unlocking Pandora's Box.

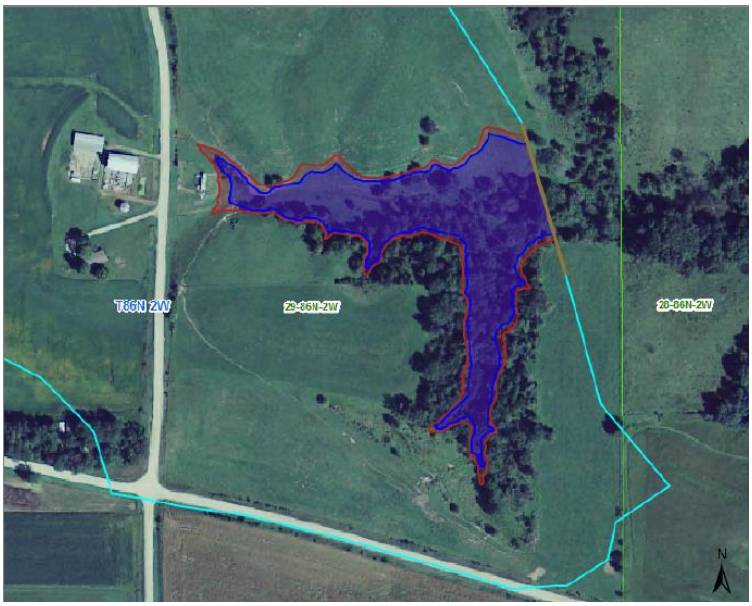

Figure 2: Pond design generated by Agren® PondBuilder.

ARS is the lead agency for developing the RUSLE2 (Revised Universal Soil Loss Equation version2), a computer model that predicts rill and inter-rill erosion caused by rainfall and runoff. Since its inception, this model has been used by conservation agencies to model soil erosion at one point in a field. Through a team effort, Agren developed the same modelling engine (RUSLE2) to calculate soil erosion at 72,000 points in 160 acres with Agren® SoilCalculator. Armed with the outputs of SoilCalculator, ag retailers can help farmers correlate soil erosion (Figure 3) to yields (Figure 4). Furthermore, ag retailers can begin to help farmers understand if soil erosion is causing a yield drag and recommend appropriate conservation practices.

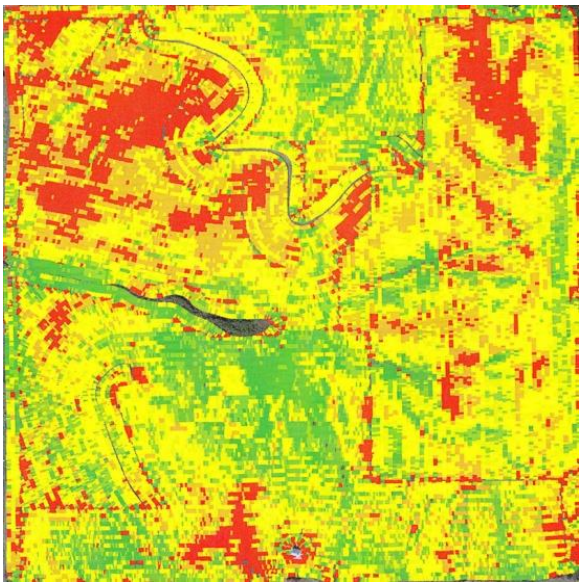
Figure 3: Erosion map generated with Agren® SoilCalculator.

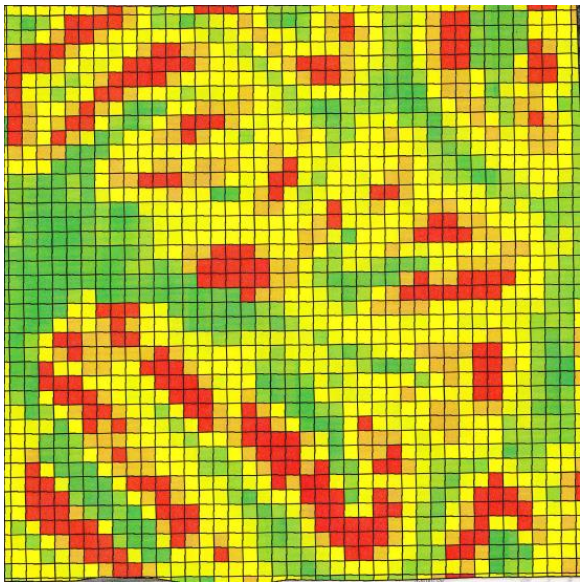
Figure 4: Farmer yield map.

The outputs of SoilCalculator are powerful and can be used to drive several other important environmental models. Agren has collaborated with researchers at the ARS Sedimentation Laboratory and the University of Tennessee to develop two GIS-based soil loss modeling tools, referred to as the Revised Universal Soil Loss Equation 2- Raster (RUSLER) and the Ephemeral Gully Erosion Estimator (EphGEE).

Once sheet and rill erosion could be modelled in a distributed fashion, Agren worked with ARS researchers Dr. Seth Dabney and Dr. Dalmo Vieira, to also develop a physically-based ephemeral gully model. Conceptually, the new model is based on the assumptions and methods similar to those used in the Chemicals, Runoff and Erosion model from Agricultural Management Systems (CREAMS) (Knisel, 1980) and the Water Erosion Prediction Project model (WEPP) (Ascough, Baffaut, Nearing, & Liu, 1997), but with a number of modifications to remove technical limitations of those older models.

By integrating with RUSLER, the integrated application provides a mechanism for the estimation of runoff and sediment loads that control the development of ephemeral gullies. EphGEE simulates ephemeral gully erosion on complex in-field dendritic channel networks, with outputs for channel erosion and sediment transport, deposition, and delivery to a watershed outlet (Vieira, 2014).

This ability to determine the transport and deposition of soil will allow ag retailer to target practices, such as water and sediment control basins, to sensitive areas resulting in significant, positive, environmental impact. With technology like SoilCalculator, ag retailers can effectively and efficiently implement precision conservation.

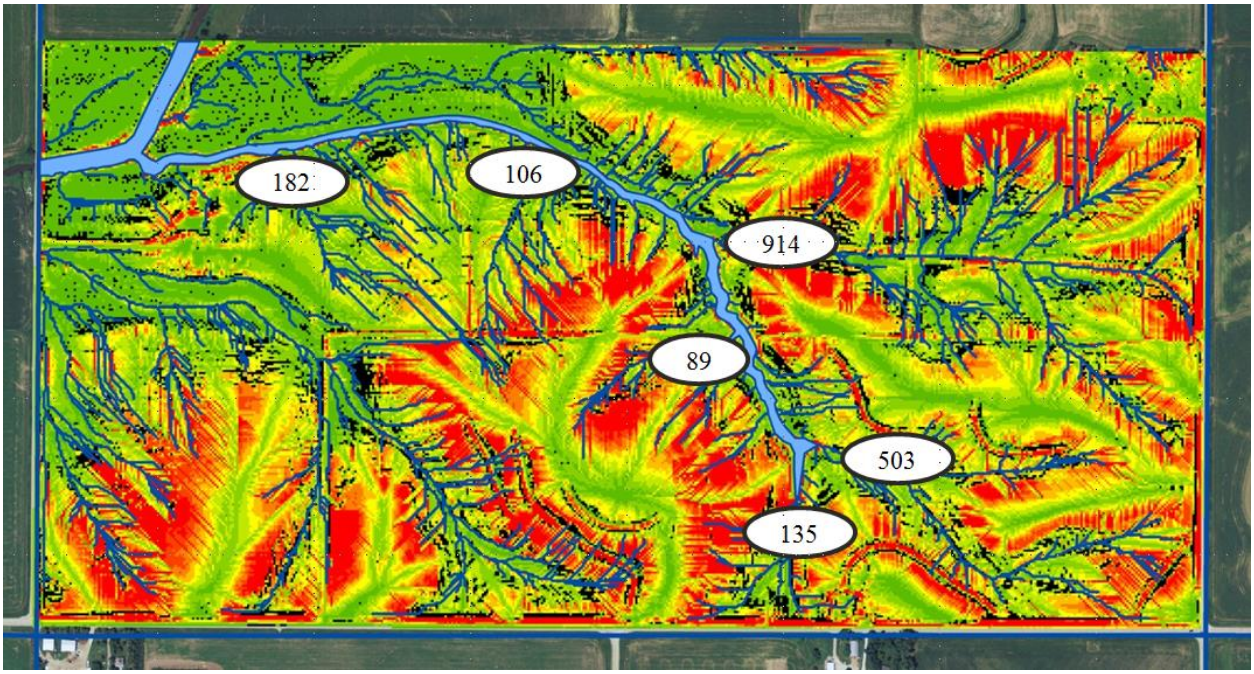

Figure 5: Using SoilCalculator in combination with EphGEE, conservation planners can model the sediment that is transported and delivered to waterways. The number in the oval represents the annual delivery of sediment from a subwatershed (measured in tons).

Agren's Sustainability Solution Platform

Agren developed the Sustainability Solution platform to allow ag retailers to introduce soil and water management solutions alongside their precision ag offering. The three-tiered platform supports delivery, sales, and documentation of soil and water management services through field agronomists. As farmer response and the market for these services grow over time, the Sustainability Solution allows retailers to provide a full-suite of precision conservation planning services.

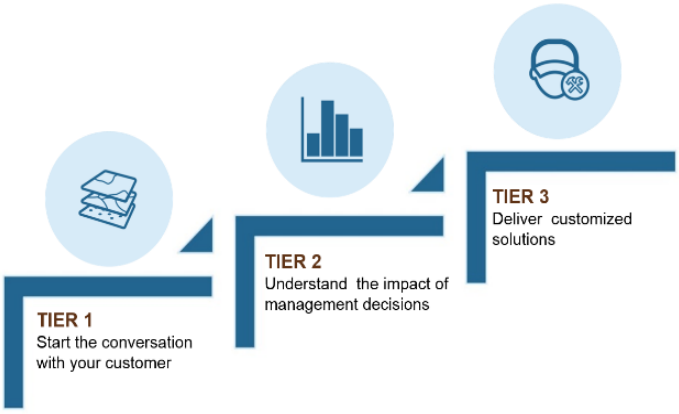

Figure 6. Agren's 3-tiered Sustainability Solution

Agren's three-step model leverages the farm-gate relationship and service-orientation of the agronomy network. It minimizes both the level of effort and specialized skillset required for the retail agronomist to engage with farmers on soil and water management. By utilizing ag retailers' precision ag platform, the delivery process is streamlined into a consultative sales process familiar to the agronomist. Using these tools, the retail agronomist is not overburdened by "one more thing" to sell. Incorporating an experienced and well-trained conservation agronomist into the process ensures quality conservation planning assistance that builds on core conservation principles and engineering standards. Also, because the retail agronomist is generating and qualifying leads, the conservation agronomist is able to service farmers across many locations.

Other Technologies for Conservation

The use of new technology in agriculture should extend well beyond bio-fuels, crop protection, automated machine control, and seed varieties. Advancements in agriculture technology should be applied to soil and water conservation, as well. Soil and water conservationists must harness existing technology to reduce the cost of precision conservation and encourage more effective technology and knowledge transfer. Agren is integrating existing technologies, such as auto-steer, machine control, LiDAR and UAVs (un-manned aerial vehicles), into its conservation platform, to improve efficiencies and farmer/ag retailer adoption.

Auto-steer is a computerized guidance system used on tractors. Auto-steer automatically steers the tractor on a specific path with high precision. If the vehicle moves offline, auto-steer adjusts the tractor position to follow the prescribed path.

Conservation application of auto-steer: In years past, field contour lines were flagged manually; farmers would follow the staked line when planting. Today, very few contour lines are staked for farmers. Contouring is still effective, but other priorities have moved contour assistance to the bottom of the priority list. However, the newest precision technology allows ag retailers to draw contour lines on a aerial map and electronically feed that information into a tractor's auto-steer system. Likewise, auto-steer could be used to layout and design contour grass strips for the Conservation Reserve Program (CRP).

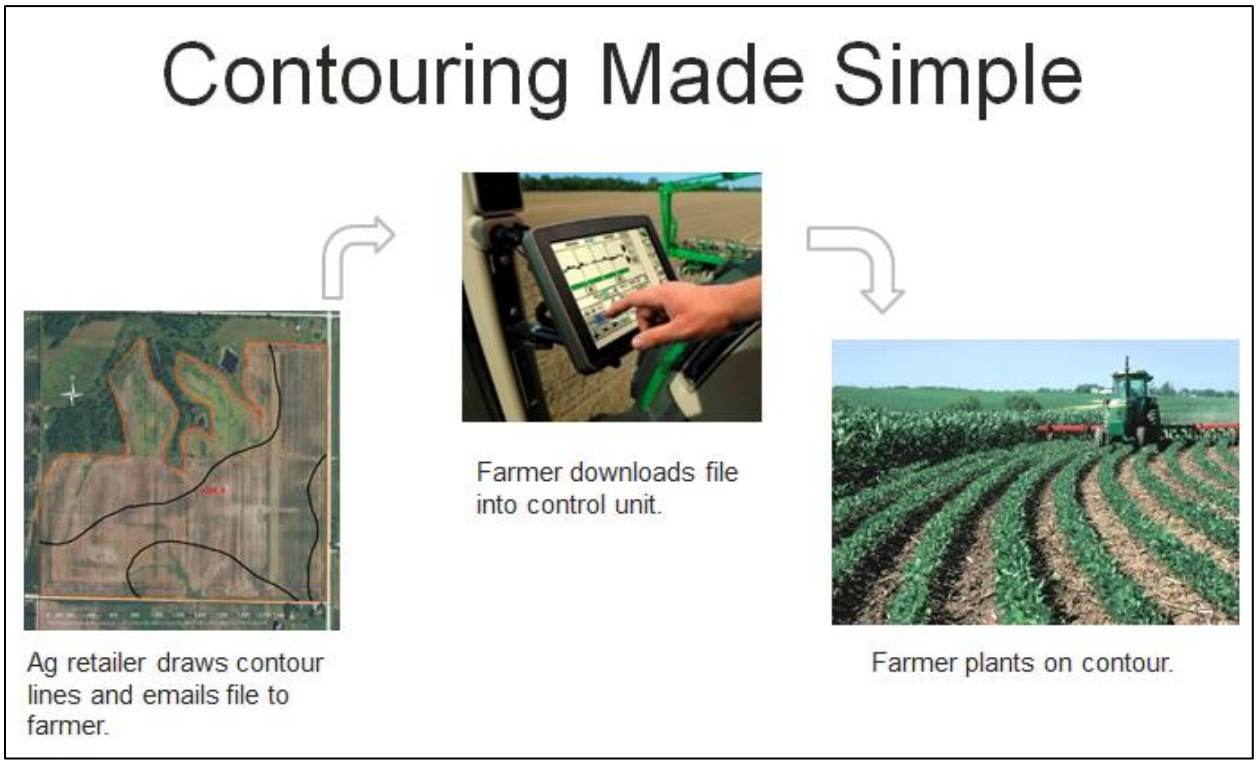

Figure 7: Automated system to design and layout contour and contour grass strip systems.

Machine control is a 3D grade-control system integrated into construction equipment such as a motor grader (or bulldozer). The grader's antenna receives a GPS location signal. The internal GPS technology compares the grader blade position to a pre-defined three-dimensional computerized model. The system automatically controls the hydraulics of the grader and raises or lowers the blade to achieve the grade design requirements. The automatic blade control allows the operator to reach grade in shorter time, translating to higher contractor productivity.

Conservation application of machine control: Imagine a conservationist designing a structure like a grass waterway using LiDAR data. Once designed, the conservationist can easily create a 3-D machine control file and email it to the contractor. The contractor then uploads the file into the machine control unit and builds the structure. This could all happen within one day, with the elimination of field layout work.

Figure 8: Motor grader with machine control.

In some locations and for some conservation practices, contractors already can obtain a 3D machine control. Given the increased accuracy and productivity, machine control files should be made available to all contractors who build conservation practices.

Currently, Agren can output machine control files for waterways. By the end of this year, Agren intends to output machine control files for all structural practices. Developers (companies like Trimble, Topcon, and Leica) are poised and waiting to expand the use of machine control for soil and water conservation. Machine control technology will fundamentally change how conservation structures are designed, staked, and constructed.

Testimonial from a contractor using machine control to build a grass waterway: https://www.agrentools.com/construction-marketplace/testimonials/

LiDAR is an emerging technology that is changing conservation planning practices from coast to coast. An acronym for **Li**ght **D**etection **a**nd **R**anging, this term is used in mapping to describe how location and elevation data is collected, using laser beams. To obtain the data, a small aircraft flies over a land mass and sends out thousands of light beams to define the surface of the earth and the heights of above ground features.

The data initially gathered by a LiDAR system is raw X, Y and Z coordinates. Processing of the data points can result in a highly accurate GIS-based digital elevation model; essentially a plaster relief of the landform made from light. Field verification trials in Iowa, document eight-inch or better vertical accuracy under leaf-off conditions.

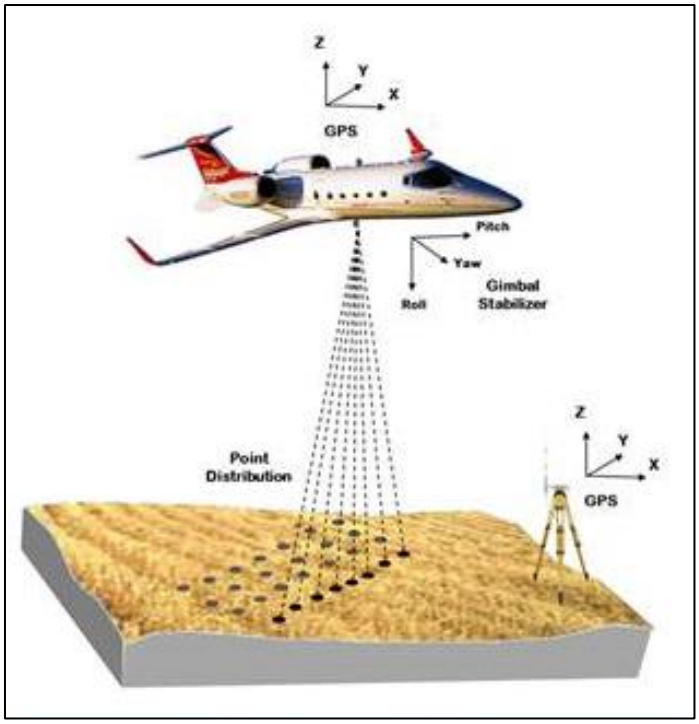

Figure 9: Collecting LiDAR data (Fancher, 2012).

LiDAR has been used for road and culvert design, fire fuel mapping and to visualize the Grand Canyon.

Conservation application of LiDAR: When LiDAR data is combined with tools like the Agren engineering tools, the information can be used to more quickly and accurately determine optimum locations for conservation solutions like ponds, waterways and basins. Additionally, the opportunity to almost instantaneously provide farmers with a visual representation of how their fields might look with different conservation practices applied is tremendous.

While there is some consensus at a federal level supporting a national database of LiDAR, this effort has encountered snags. While these snags are being sorted out, cities and states are moving ahead with their own statewide LIDAR collection. Significant regions of the Eastern United States now have LiDAR coverage. Although LiDAR is available in many areas, it unfortunately varies in quality. In some cases, LiDAR is accurate enough for actually engineering practices, but it is always good enough for planning conservation practices.

NRCS is researching the use of LiDAR. According to USDA, NRCS, "LiDAR suitability for conservation engineering work is determined by data quality, such as the accuracy and precision of the LiDAR dataset. Data quality is impacted by aerial flight precision, type and execution of elevational ground control, the rate and density of sampling, and the level of post processing." (USDA, NRCS, 2015)

Unmanned Aerial Vehicle (UAV): Where LiDAR data is accurate enough only for planning soil and water conservation practices, alternative collection methods can be used. Using UAVs is an emerging way to collect low cost topographic data.

Figure 10: UAV used to collect high quality topographic data.

In the spring of 2016, Dr. Rob Wells, USDA Agricultural Research Service, compared photogrammetry measurements, of several data collection methods, to determine the accuracy of UAV-collected topographic data. Dr. Wells found that the UAV methodology provided a highly accurate substitute for more labor intensive ground collection of topographic data. Dr. Wells reported, using a UAV, topographic data with a vertical accuracy 1 to 2 cm can easily exceeds the survey quality specified by NRCS for engineering practices.

Conservation application of Unmanned Aerial Vehicle (UAV): Using a UAV can vastly reduce the time spent collecting accurate topographic data for conservation practice design. Additionally, UAVs can collect survey data when soil conditions prevent traditional survey crews from working. In 2016, Agren contracted with Top Intelligence, a regional provider of drone related technology to fly seven different sites at two different times, for a total cost of $7,500, or an individual cost of $530/site which includes process and cleaning the data. The cost of collecting data with UAV in this case, is certainly less expensive than sending a crew to the field to collect survey data.

Conclusion

Public pressure on agriculture is at an all-time high. The public want foods grown more sustainably and improved water quality. We, in the ag community, need to up our game. We need to speed up conservation practice adoption. We know farmers want to receive conservation information from their ag retailers. And, we know ag retailers are interested in providing this service, but they need encouragement and motivation to integrate precision conservation with their precision ag platform. The conservation effort can be accelerated by ag retailers who are equipped with state-of-the-art technology. It all starts with giving farmers the information they need to make a decision and providing fast and efficient technical assistance for implementation.

Works Cited

Arbuckle, J. (2013, April 16). *Staff:Arbuckle: Iowa State University.* Retrieved May 6, 2016, from Iowa State University Department of Sociology Web site: http://www.soc.iastate.edu/staff/arbuckle/Arbuckle%20PPT%202013%20Climate%20change%20beliefs_concerns_attitudes_toward_adaptation_mitigation.pdf

Arbuckle, J., & Bates, H. (2015). *Iowa Farm and Rural Life Poll - Farmer Perspectives on Iowa's Nutrient Reduction Strategy.* Ames: Iowa State University.

Ascough, J., Baffaut, C., Nearing, M., & Liu, B. (1997). The WEPP Watershed Model: I. Hydrology and Erosion. *Transactions of the ASAE, 404*(4), 921-933.

Fancher, Z. (2012, December 15). *Using ArcGIS 10.0 to develop a LiDAR to Digital Elevation Model workflow for the U.S. Army Corps of Engineers, Sacramento District Regulatory Division*. Retrieved May 13, 2016, from American River College Los Rios: https://ic.arc.losrios.edu/~veiszep/28fall2012/Fancher/G350_ZFancher.html

Helms, D. (2010, February 19). National Historian. (T. Buman, Interviewer)

Knisel, W. (1980). *CREAMS: A Field Scale Model for Chemicals, Runoff, and Erosion from Agricultural Management Systems.* Washington, D.C.: U.S. Department of Agriculture.

Lawrence, P. (2015, March 19). Chief of Staff, USDA NRCS. (T. Buman, Interviewer)

USDA, NRCS. (2015, January). *Using LiDAR for Planning and Designing Engineering Practices.* Retrieved May 12, 2016, from USDA, NRCS eDirectives: http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=36637.wba

Vieira, D. A. (2014, December 11-14). *Distributed soil loss estimation system including ephemeral gully development and tillage erosion.* (D. A. Vieira, Performer) Sediment Dynamics from the Summit to the Sea; ICCE/IAHS International Symposium, New Orleans, LA.