

Colorado Sugarbeet Growers Association and American Sugarbeet Growers Association

United States House of Representatives
Committee on Small Business
2361 Rayburn House Office Building
Washington, DC 20515

January 14, 2020

Dear Chairwoman Velazquez:

Thank you for the opportunity to submit a statement for the record for the January 9, 2020, hearing on Agriculture Technology (ag-tech). My statement will focus on ag-tech usage in Colorado, where I farm, but will also shed light on ag-tech usage adopted in the other sugarbeet producing states (California, Idaho, Michigan, Minnesota, Montana, Nebraska, North Dakota, Oregon, Washington, Wyoming). Sugarbeets are grown in 11 states by 10,000 family farmers who are the lifeblood of the rural communities in which they live and farm.

Background on Sugarbeet Industry: The sugarbeet is a vegetable that is 75% water, 20% sugar/molasses, and 5% pulp tissue. The US grows approximately 1.1 million acres annually. Over fifty percent of all sugar produced domestically is from sugarbeets and is identical to cane sugar. It is processed in twenty-one farmer-owned factories. The sugar extracted from sugarbeets is an essential ingredient in the U.S. food supply. Byproducts of sugarbeets, pulp and molasses, are used primarily as animal feed.

Environmental Benefits of Bioengineered Sugarbeets: From a global sugarbeet and sugarcane perspective, our industry is on the forefront of sustainability and environmental progress. Through the universal adoption of Roundup Ready[®] bioengineered seeds, our industry has identified 25 environmental benefits that we have been able to achieve. We listed them in a 2015 [submission](#) to the National Academy of Sciences National Research Council Committee on Genetically Engineered Crops. In general, the environmental benefits of bioengineered sugarbeets can be broken into the following categories: lower herbicide usage, better plant health, better soil conservation and microbial health, and improved water quality and water conservation.

Advancements in all of these categories contribute to dramatic reductions in greenhouse gas emissions through less soil disturbance, less fuel consumption, and healthier plants converting more carbon dioxide into oxygen. Scientific studies have shown that bioengineered sugarbeets have reduced ecotoxicity and environmental risk by 92 percent and 98 percent respectively. Through biotech, our farmers are able to utilize more sustainable farming practices that have cut soil-derived carbon emissions by 80%.

Plant Breeding: We cannot underestimate the importance of ag-tech in breeding. In Colorado, over the past 15 years, advances in breeding and cultural practices have vastly improved farmers' land use efficiency; increasing sugar yield from around 8,500 pounds of sugar per acre to over 12,000 pounds per

acre. For example, breeders have been able to exploit molecular markers linked to disease or pest resistance genes that occur naturally in sugarbeet and its closely related wild relatives. As a result, the average sugarbeet grown in the U.S. contains upwards of seven native traits effective against common pests and diseases. The outcome is a sugarbeet that can naturally defend itself against pests and diseases without the need for pesticide applications. Breeders have also been able to use similar techniques to improve hybrid performance.

USDA Research and Gene Editing: Our industry greatly benefits from research being done through the United States Department of Agriculture's Agricultural Research Service (USDA ARS). For example, the USDA ARS's Edward T. Schafer Agricultural Research Center (ETSARC) in Fargo, North Dakota is leading critical research into one of our industry's most destructive pathogens, *Cercospora beticola*.

The sugarbeet genome was mapped in 2014. Research to generate sugarbeet germplasm with new disease- or pest-resistant traits is conducted at ETSARC as well as in Fort Collins, Colorado at the USDA ARS Center for Agricultural Resources Research (CARR). These research centers along with other USDA-ARS laboratories conduct research that will identify critical targets that may be utilized for gene editing in the near future. As previously mentioned, we have achieved incredible gains from bioengineered sugarbeet seeds but new advances in plant breeding innovation, such as gene editing, will rely on continued and sustained research of the sugarbeet genome.

Seed Uniformity: Additional advancements in seed technology have assisted beet producers. The natural shape of sugarbeet seeds is a rough star of variable weight and size. These natural variances made planting uniformity very difficult. The first step was to give seeds a uniform shape, which was done by grinding the seeds to make them smoother. Coatings were then used to pelletize the seeds which made them round, but seeds still lacked weight uniformity. The lack of weight uniformity caused variances in planting distances as seeds of different weights dropped down the planting tubes at differing speeds. The result was varying planting distances that often that meant hand labor had to be used to thin out the beet stand to achieve proper spacing. Pelleted seeds are now weighed and sorted to assure that they are a uniform size and weight. In addition, seeds are X-rayed prior to being pelletized so that non-germinating seeds can be more accurately separated and removed. This results in a much higher percentage of viable seeds being sold to and planted by the grower.

Seed Priming and Coating: The seed coatings also include low-level pesticides applied in a way that provides direct protection of the sensitive seedling but prevents any side interactions with beneficial organisms in the environment. A major development in seed technology is priming. This process is achieved when the natural germination inhibitors in the seeds are washed off and then the seeds are treated to begin the germination process. Once the germination process is started, it is stopped and the seeds are coated where they are primed and ready to germinate once they are planted. Prior to this priming, it used to take 7-10 days after planting to see growth. Now it only takes 3-6 days from planting to see above ground growth.

Planting Technology: Uniform seeds work in conjunction with technologies developed by Precision Planting[®], Monosem, John Deere, Case IH, and other equipment manufacturers. These advanced planters control placement of seeds with precise spacings and depths. One way that planting efficiency is achieved is by utilizing sensors to monitor how smooth the ride is for the planter units. If the ground is rough, the tractor operator can slow down to insure proper seed placement. Growers are able to utilize advanced planters to accurately apply liquid fertilizer at the desired rate per acre at the time of planting.

Due to accurate GPS signal, the planter also uses swath control and row shut-offs to prevent seed from overlapping on areas of the field already planted thus preventing seed and fertilizer waste.

Water Issues: Water issues, both quality and quantity are of great importance to our industry but for different reasons in different sugarbeet growing areas. Sugarbeet growers in most of Michigan, Minnesota, and North Dakota do not have to irrigate their crops. Their main objective is often to get water off of the field while protecting the soil from erosion and oversaturation. Farmers in these states also have to practice water conservation under drought conditions. Sugarbeet growers in the irrigated regions of the country (California, Colorado, Idaho, Montana, Nebraska, Oregon, Washington, and Wyoming) are very focused on water conservation because water is a very limited resource in those states.

In Colorado and other western states, we have been able to achieve incredible gains in water and energy savings through the adoption of bioengineered sugarbeets and additional improvements in technology. For example, use of Roundup® ready sugarbeets has allowed me and my fellow farmers across the nation to adopt conservation tillage practices not possible with conventional production. We have reduced the trips across the field, reduced fuel usage, reduced soil disturbance, conserved water, and have promoted vastly improved soil and soil microbial health.

Irrigation: On my farm we also utilize fertigation, as do some other irrigated sugarbeet growing regions that use center pivot irrigation. Fertigation is the delivery of plant nutrients through irrigation. Combining practices reduces the energy and water used while also allowing more efficient use of fertilizers. By “spoon feeding” the sugarbeets throughout the season, we reduce nitrogen leaching and vastly reduce our carbon footprint.

On my farm we have flow meters on all of our irrigation sprinklers to record water usage. We recently started using Variable Frequency Drive (VFD) electric motors. These motors reduce the energy required to pump water to each sprinkler. As you know, water pumped uphill requires more energy. On farms with elevation changes, like my own, the VFD motors have proved to be a great energy and cost savings. We also use an app called ReinCloud™ that lets us have full control of all of our sprinklers on our phones or iPad. The app helps us ensure that each sprinkler is operating as programmed and will immediately notify us of any issues. Water is a precious resource in Colorado and the west. In Colorado, water is drawn from surface sources or aquifers such as the Ogallala aquifer so any efficiencies that can be gained around water usage are significant.

Rural Broadband: Fortunately, much of Colorado has access to rural broadband. Unfortunately, that is not true across the country. The United States Department of Agriculture (USDA) outlined the importance of rural broadband infrastructure in the report published on April 30, 2019: “[A Case for Rural Broadband: Insights on Rural Broadband Infrastructure and Next Generation Precision Agriculture Technologies.](#)” It is my hope that farmers across the nation will soon be able to access rural broadband and the corresponding benefits of that access which include more efficient weather modeling, pest prevention and monitoring, input use and management, and smart irrigation.

Satellites: Satellites have greatly improved farming. Satellite imagery allows growers to capture the different shades of green beet leaf canopies and use that data as a basis to identify varying rates of nitrogen in the soil. Maps from these images are developed and then used in the fertilizer applicator to vary the rate of nitrogen, putting more fertilizer where needed, and less where it is not needed. These efficiencies allow us to be more environmentally and economically sustainable.

Drones (On-Farm): Another example of technology that has greatly improved farming and processing of sugarbeets are drones. In the field, farmers use drones to scout fields for disease and pest pressures. Getting control of the issues before they become outbreaks allows us to decrease our use of resources such as pesticides and fuel. Our farmers are able to scout over 500 acres in less than two hours with much greater accuracy than can be achieved by the human eye. Drones are also used to measure harvested versus unharvested portions of the field, damage from flooding, and areas where drainage needs to be improved.

Drones (Sugarbeet Storage Piles): Drones are also incredibly useful to our industry after harvest. The majority of sugarbeets are stored in massive commercial piles, upwards of 25-feet high by 150-feet wide and a quarter-mile long, until they can be processed. The cool or sometimes freezing ambient air helps to condition the beets for long-term storage. The exact piling methods vary across regions, but the risk of pile loss is common across the country. Piles can suffer from “hot spots.” This occurs because of uneven piling temperatures, diseased beets, or damaged beets within a pile. The rotting beets spread to other sections of the pile. Our cooperatives use drones with infrared cameras to identify hot spots that need to be processed immediately or discarded to avoid further loss. In addition, our industry uses fans to pump cold air into the piles to cool or freeze the beets. Drones can be used to accurately indicate when fans should be used, or when specific segments of piles should be excised for immediate processing when external ventilation is not available.

Soil Mapping and Variable Fertilizer Application: Sugarbeet growers can also fully utilize ag-tech to prepare for the next harvest about 10 months prior to planting. Growers can conduct extensive soil tests of fields. They then use an app that lays out GPS points in 2.5-acre grids on a particular field. Soil samples are taken at these points and then tested by a lab. The data from the tests can then be used in a software program to create prescription variable rate maps for applying fall fertilizer for the upcoming sugarbeet crop. This predictive technology not only helps to reduce input costs, but also increases yields to get more efficiency from production acres. Rates are varied based on the soil samples and are adjusted every pass. The tractor uses Real Time Kinetic (RTK) GPS signal to auto-steer and apply the fertilizer with sub-inch accuracy into strips that were previously made by a strip tillage machine. The following spring, growers are able to plant directly and accurately into the strips with the guidance of the RTK signal.

GPS Technology: The use of RTK GPS technology ensures that the tractor implements are always positioned in the center of the strips to achieve maximum efficiency of the fertilizer in the root zone. Following planting of sugarbeet seeds, growers make anywhere from 2-4 herbicide/fungicide applications throughout the season with a sprayer, depending on the need. Sprayers are pulled with a tractor equipped with auto-steer that follows designated GPS paths. Applications also utilize swath control to prevent overlapping treatments to fields through the monitor in tractor cab.

Spray Nozzle Technology: Sectional control of spraying was an important technological step, but nozzle-by-nozzle shutoffs has advanced us further. This technology has reduced excess chemical application and overlap, while also reducing harmful secondary damage known as “crop burn” which causes great stress to the plants. With these advanced nozzles, additional savings are achieved through “turn compensation.” This accounts for spray overlap inside the boom’s radius. The boom’s outside radius speed increase is now calibrated for precise application. A direct injection monitor by KB Manufacturing, LLC monitors chemical usage and remaining product on enclosed spray systems.

Nanotechnology: A company called Vive Crop Protection[®] uses nanotechnology to increase the efficiency of existing crop protection chemistries. Nanotechnology is the science of small things. Understanding how crop protection products behave at the "nano-scale" helps Vive optimize their performance when applied to a crop, or on the soil, or mixed with another product in the spray tank. Vive's first products are designed to be co-applied with a fertilizer in a single pass, which helps sugarbeet farmers increase yields and sugar content, while reducing water usage, fuel usage and soil compaction. This helps sugarbeet farmers do more with less.

Harvest: Ropa[®], which manufactures sugarbeet harvesters and loaders, has a new generation of on-board computers that is the basis for telematics, predictive analytics, online diagnostics, and partially autonomous sugar beet harvesting. Telematics allows Ropa technicians to monitor the machines by using GPS and onboard diagnostics to record movements on a computerized map. Amity Technology[®], manufactures sugarbeet carts with tracks instead of tires that can run in wet conditions and unload 35 tons of sugarbeets in 90 seconds. It manufactures sugarbeet defoliators with Active Height Control that auto adjust the height and location of the defoliator to lessen damage to the sugarbeet crop. Amity Technology also manufactures a variety of sugarbeet harvesters that are engineered to limit the amount of soil that is taken from the field and contain Active Depth Control to balance the constantly changing weight of the harvester to maintain the proper depth of the lifting mechanism in the field.

Conclusion: Since I began farming with my father 50 years ago, I have seen quantum leaps in technology. Our industry has made incredible advancements due to developments through technology. Ag-tech increases our efficiencies, improves yields and helps us become more sustainable. All facets of our production have benefited from improvements in ag-tech. These improvements help us avoid wasting resources which benefits the environment and allows us to be economically sustainable. We are constantly looking for new technologies and methods to improve our sustainability. The future for our industry and our ability to continually improve looks bright.

Thank you again for the opportunity to submit this statement for the record.

Sincerely,



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