High Tech Agriculture: Small Firms on the Frontier of Agribusiness

Testimony presented to the House Committee on Small Business, Subcommittee on Agriculture, Energy, and Trade

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Ladies and gentlemen of the committee, I am honored and delighted to speak with you today about agriculture and how the many small business owners who comprise most of our nation's agricultural production are finding challenges and opportunities in the adoption of ever-advancing technology. I will also present information to you about how those of us who are teaching agriculture in higher education are preparing the next generation of agricultural producers to successfully incorporate new technology into their farm businesses.

Agriculture has been at the center of my life's work since I was a boy growing up on a beef cattle and dairy farm in the New River Valley of Southwestern Virginia. It is a farm that my family has owned for six generations since 1795, and one that I will pass along to my children to continue a legacy of a small family business that is helping to feed a hungry world. And that task will become increasingly important and challenging as the world's farmers will need to feed over 9 billion people by the year 2050.

For the past eleven years, I have also taught courses in agricultural business management in the Agricultural Technology Program in the College of Agriculture and Life Sciences at Virginia Tech, which is Virginia's Land Grant University. So I can speak to you today both as a small business owner of a farm and as someone who is helping to train tomorrow's farmers, agricultural supply business managers, farm equipment dealers, and others who will keep America at the forefront of agricultural production.

It is no exaggeration to say that technology in agriculture has changed more in the past 100 years than it had in any 100 years prior, and perhaps more than in all of human history combined. As an example of that, when my father, who was born in 1925, was growing up on our family farm, he walked behind a horse that was pulling a plow, just as every generation before him had done. A quarter century later, he was driving a tractor with more power than 100 of those horses. By the

time he handed the farm off to me, we had stopped plowing altogether because we had begun using zero tillage planting as a soil conservation practice.

So, what it happening now and what will continue in the future with advancements in agricultural technology? Just as it was impossible for people in the early 20th Century to foresee the advancements that awaited them, so it is difficult for us to say what advances in agriculture might be in the next 25, 50, or 100 years. But what we can see is what some recent advancements have been and where the industry appears to be headed with them.

There is no question that precision agriculture is an all-important driving force in crop production now and appears that it will be even more important in the future as it is more widely adopted, as the technology will likely become more affordable, and as it continues to improve over time. Precision agriculture is a term used to describe several related technologies that are often used together to decrease input costs and increase yields. Those technologies include soil and yield mapping to great precision using GPS, tractor guidance systems that allows for automated tractor operation in fields, and variable rate application of fertilizer, chemicals, and seeds. Unmanned aircraft, or drones, are also often incorporated into precision agriculture to provide imaging of fields that enhance decision-making on irrigation and application of chemicals and fertilizers.

A USDA study (USDA ERS Report Number 217) released October 2016 found that precision agriculture was used on 30-50% of US corn and soybean acres in 2010-2012. There is no doubt that the percentage has risen significantly since then.

Let me give an example of the use of precision agriculture and how it is transforming how we farm. I visited a dairy farm in central Virginia a year ago where one of my students was working as an intern during the summer. The farm owner said, “Joe, come back in two years and I won’t be sitting on a tractor planting corn. I’ll be sitting at a desk watching a monitor of 5 un-manned tractors in 5 fields pulling 5 corn planters.” Each of those planters are able to change the rate and the variety of corn seed to match the precise conditions of the soil the planter is driving over.

The implications of this technology to enhance production is, as you can tell, staggering. So are the changes it might have on the agricultural industry. First, the technology, while designed to improve profits by providing savings in input costs

and increases in yields, is very expensive. The USDA study found only a small increase in farm profitability among farms that had adopted precision agriculture during the time of the study. Hopefully, profitability will increase as the technology becomes more affordable over time.

Another consideration is that precision agriculture and other technological advancements make more sense on larger farms where their fixed costs can be spread out over more acreage. That would indicate that we might expect larger farms to adopt the technology first and that we might see a trend of fewer but larger farms. And, indeed we are seeing those trends. It is important to keep in mind, however, that even large farms in the US are still considered small firms. Most, in fact nearly all, are family owned.

Another implication of precision agriculture and other technologies in agriculture is a reduction in the number of people needed for farm labor. As you can imagine from the example of the dairy farmer, he won't be hiring anyone to drive those 5 tractors. The reduction in the need for farm labor and labor costs is one of the benefits of the technology, but it has serious implications for rural communities.

Another example of a labor-saving technology that is becoming increasingly popular in agriculture is the so-called robotic dairy. Using this technology, no one at one of these dairy farms actually milks the cows any more. Instead, the cow is trained to walk into a stall whenever she wants to be milked, and she is fed some grain from an automated feeder while a computerized robotic milking machine attaches to her and milks her. It's truly amazing to see in practice. It costs about a half million dollars.

That leads me to another example of the staggering changes we are seeing in agriculture, specifically in the dairy industry. A colleague of mine from Virginia Tech took her Dairy Management class to visit 4 Virginia dairy farms that milked a total of 5,000 cows. A generation ago, given the size of the typical Virginia dairy herd, she would have needed to have visited 50 dairy farms to see that number of cows, and even more to see the equivalent amount of milk produced, since the average cow produces much more milk now than a cow of 20 or 30 years ago. Again, the use of technology favors larger farms that spread out fixed costs, so we are seeing fewer and larger dairy farms with increased production per cow.

These changes associated with technology and increased economies of scale increase production, which makes agricultural products more plentiful and less expensive. Therefore, they ultimately benefit consumers, perhaps more than they actually benefit the farmers who use them.

Given time limitations, I have discussed only a little bit about only a few of the changes in technology we are seeing in agriculture. Others would include the use of genetically modified crops such as Round-Up Ready corn, new technology in chemicals and particularly in herbicides, and the increasing use of drones for a number of applications.

We on the faculty of the Agricultural Technology Program at Virginia Tech, like faculties of colleges of agriculture around the nation, are endeavoring to keep up in teaching courses that incorporate new technology as we train the next generation of agricultural producers and suppliers, most of whom will own, manage, or work for small businesses. An example is a new course that we added to our curriculum three years ago specific to teaching precision agriculture. We were able to do this with a grant of the precision agriculture equipment from a manufacturer. So, the students are learning on the equipment that they may use some day or may already have at their home farm. Public/private partnerships such as this one can be greatly beneficial to both the students and to the technology manufacturer, and I would encourage your states' Land-Grant universities to pursue a similar partnership if they have not done so already.

Given the brief time I have been asked to speak, I will stop there in what is a very large and broad topic, but one I am glad your committee has seen fit to put onto its agenda to learn more about. To the extent I am able, I will now try to answer any questions you may have or to provide you answers later if I need to do more research before I can answer accurately.

Thank you.