

## You Decide: Is Farming a High-Tech Industry?

By Dr. Mike Walden, North Carolina Cooperative Extension: My paternal grandfather was a farmer in Ohio. He raised a variety of crops, but his "bread and butter" were hogs. In southwestern Ohio hogs were big business a century ago. In fact, at one time Cincinnati – where I was born – was known as "Porkopolis." Farmers like my grandfather drove their hogs from outlying farms to the packing houses in the city.

The day my grandfather bought a tractor changed the economy of his small farm. The tractor was a technological breakthrough for farmers. Tractors could plow many more acres in a day than a horse or mule. Plus they conserved the energy of the farmer, who could now ride rather than walk and push their way through fields. As a result, the productivity (output per input) of farmers soared. The productivity of farms jumped an amazing 140 percent between 1910 and 1950. This is what technology does. It makes us get more from less.

And farm gains have kept coming. With the introduction of machinery like the combine harvester, techniques such as irrigation and pest control and improved knowledge about adapting plants to the local environment, farm productivity took another 170 percent leap from 1950 to 2010, more than doubling the productivity gains in the nonfarm economy.

There have been three major economy-wide changes resulting from this revolution in farm productivity. One is the need for fewer workers in farming. With technology, machinery and improved knowledge about growing continually increasing the amount of output each farmer could achieve, millions of workers left farms in the 20th century. This movement of workers off the farm in the first decades of the last century was an important factor behind the development of new industries in the nation. Ex-farmers moving to cities built and operated the factories of the growing manufacturing sector. Later, the children and grandchildren of these farm-to-factory workers were behind the growth of the technology, education and healthcare sectors.

The second change has been urbanization. The increase in farm productivity and the decline in the number of farm workers dramatically changed where people lived. In 1900, over a third of people still lived on farms, and as late as 1980 the majority of North Carolina's population resided in rural areas. Today, North Carolina is a majority urban state, with two-thirds of the state's people living in cities or urbanized areas.

Last, gains in farm productivity have directly led to the increased affordability of food. A century ago the average household spent over one-fourth of their disposable income on food. Today, food spending – both for food eaten at home as well as food consumed in restaurants – requires only 9 percent of the typical household's total budget. So, just as enormous gains in farm productivity allowed workers to develop and grow the manufacturing and service sectors, those gains also freed-up resources for households to spend on the outputs of those industries.

Are the productivity gains in farming over? Hardly! Experts see new technologies being adopted on the farm that will make the

advances of a few decades ago seem quaint. Farmers have always relied on information about farm conditions to know when to irrigate, provide nutrients to crops and give treatment to animals. In the past, much of this information was based on guesswork or "rules of thumb." But no longer. Crop sensors and livestock biometrics are giving farmers access to a wealth of real-time data telling them the precise condition of their animals and crops. Treatments and applications will no longer be general, but instead will be precise in amount and timeliness. For example, rather than irrigating an entire field, farmers can determine what parts of their fields need water and exactly how much. This both saves money and improves production.

Farm equipment is also being taken to a new level. A long-time problem with tractors is the compacting of soil caused by their heavy tires. New tractor tire technology is being implemented to reduce this issue. Also, environmentally-friendly farm machinery engines are being manufactured. And yes, as you may have guessed, agricultural robots – dubbed "agbots" – may soon be coming to farms, just as may be driverless tractors and combines.

As data and information become increasingly available to farmers, the need to access and analyze the data becomes more important. Fortunately, new internet access for remote rural areas is being perfected, as are "agricultural apps" for smartphones and tablets to allow farmers to apply sophisticated decision-making techniques to the data.

There are other technologies on the way in customized seeding, drought resistant crops and environmentally-friendly and cost-efficient pest control. The technology revolution in farming started one-hundred years continues and will push farm productivity to new heights.

The late Nobel Prize winning economist James Buchanan titled his memoirs, *Better Than Plowing*. Having grown up on a farm in Tennessee in the early 1900s, he experienced the extraordinarily hard work involved in farming, just as my grandfather did. Farming is still hard, but technology has made it better and definitely more productive.

So is farming a high-tech industry? Some say it was actually the first high-tech industry. You decide!

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