Agriculture and agribusiness are a $92.7 billion a year industry in North Carolina, and Agriculture Commissioner Steve Troxler is determined to see that value top $100 billion soon. At North Carolina State University’s College of Agriculture and Life Sciences, three major initiatives are designed to help the state meet and exceed that goal.

I'm Dee Shore, and in this episode of Farms, Food and You, we hear from four members of the college who are playing major roles in the North Carolina Plant Sciences Initiative, the Food Processing and Manufacturing Initiative, and the Food Animal Initiative. These efforts are aimed at transforming agriculture in North Carolina and opening new opportunities for farmers and others.

NC State's agricultural initiatives have their roots in the College of Agriculture and Life Sciences strategic planning process that Dean Richard Linton led several years ago. Steve Lommel, who is the college’s associate dean for research, says that the process caused college leaders to think big about ways to ensure that teaching research, and extension programs could drive positive change for farmers and consumers.

Steve Lommel says the Plant Sciences Initiative has gained tremendous momentum recently in achieving its goal of interdisciplinary science to advance crop production.

A 185,000 square foot plant sciences building is set to open on the Centennial Campus in Raleigh in late 2021 or early in 2022, and with NC State seed funding, four teams of faculty members throughout the university are at work on research and outreach projects.
These projects focus on determining whether fungi that live inside plant leaves could be harnessed to create crops that are more resilient in the face of drought and disease, developing an innovative platform to monitor crops for signs of early plant disease, rethinking how water- and nitrogen-based fertilizers are used to support the next generation of sustainable and cost-effective farms, and creating a way to combine advanced imaging and computer technology to grow a superior sweet potato.

Meanwhile, four NC State faculty members have been named to lead the initiative’s activities in the areas of plant improvement, resilient agricultural systems, education and outreach, and data-driven plant sciences. Chris Reberg-Horton, a professor who specializes in organic agriculture, is the platform director for resilient agricultural systems. He says that the initiative is shaping the direction of his own research.

**Chris Reberg-Horton (04:29):**

I can tell you, in relationships alone, it’s been pivotal. Sometimes you don’t even know what disciplines you need until you meet someone, and you learn what they do, and you hear about the applications they’re making in something else, and you’re like, “Oh, I could use that. I didn’t know I could use that until I heard it just now.”

I just find that my own research, I work on monitoring plant health, plant outcomes on farms, on active working farms, so that we can see data in real time about what’s going on. I had no idea, some of the technologies that are out there that make that even more possible than I’d dreamed.

First of all, we can do more from space than I would’ve ever dreamed. There are a more broad array of sensors up there in space, some of them on military satellites, but there’s folks on our campus that know about every type of sensor in space that you can imagine. And so I think that’s going to be the future of a lot of prediction that goes forward in agriculture.

**Dee Shore (05:22):**

And prediction, Reberg-Horton says, is key to having crops that are more resilient to drought, disease, pests and other stressors. It’s especially important in an era when farmers have seen enormous productivity gains but haven’t increased their ability to adapt rapidly to change. One factor behind the loss of resiliency is that compared to earlier times, some farmers today don’t have a deep understanding of every piece of land that they farm.

**Chris Reberg-Horton (05:55):**

I think the big thing that we need out of science right now is a tremendous amount of location-specific knowledge about how our agricultural systems are functioning. I love to make the comparison back to a much older system. We used to have a tremendous number of farmers working in America, and they understood the local conditions of each and every field.

Today, thousands of acres are under the management of just a couple of people oftentimes. Clearly, we can’t have the same awareness of each piece of land, what is occurring on each piece of land throughout the production season, and that’s what we need science and engineering to provide for us. We need that same situational awareness we might’ve had a hundred years ago but distilled down into actionable intelligence that the grower can act on.

**Dee Shore (06:44):**

Steve Lommel says that helping farmers gain such actionable intelligence is among the key goals of the North Carolina Plant Sciences Initiative.
Steve Lommel (06:54):
We expect there to be much more integrated decision-making tools for farmers. Based on future economic projections, and genetics, and the weather, we can tell farmers what type of plant to grow, what row spacing, months before they do the planting, based on what we predict is going to happen. We can tell them what kind of microbe to add to the soil to ensure maximum yield, even under very stressful climatic conditions. So we’re looking for these big global answers, and the idea, again, is to increase yield and productivity.

Dee Shore (07:29):
Providing farmers with data-informed intelligence that they can use to improve their operations is also one of the goals of the Food Animal Initiative. Lommel explains.

Steve Lommel (07:42):
There is a professed goal to increase the ag economy of the state to over $100 billion a year. And really, to move the needle on that we need to take this big science approach – this big solution approach to animal agriculture as well.
The dean in our college and the dean of veterinarian medicine have teamed up to create a team of folks and create a new culture and a new process there to improve animal agriculture – yield, welfare, all the different aspects or issues in food animal agriculture and, again, using all the different disciplines that we have available to us now. And really, the transformational discipline right now is big data, and analytics, and using artificial intelligence to make these big complex decisions with the ever-growing amount of data we have.

Dee Shore (08:35):
Animal Science Department Head Todd See agrees and notes other Farm Animal Initiative goals that were informed by dialogue with farmers and others involved in animal agriculture in North Carolina.

Todd See (08:49):
One of the big needs that our stakeholders in the industry tells us is, help with communicating the reality of modern agriculture. I think it’s true across all agriculture that people are very removed from farming and food production today, and there’s very little understanding about how farming is done and what goes on. So how can they better communicate what they’re doing? And so that’s always one of their top concerns.
But they’re also very interested in making sure they’ve got good food safety, that we’re meeting market demand and consumer preferences for the types of products and the changing demographics of what people need to eat.
As always, infectious disease is very important. There are strains of viruses that impact our animals. Just like in people, they can be devastating, and coming up with vaccines and disease management and health opportunities is a priority, and there’s a lot of interest in the new technologies, precision agriculture. How do we use sensors, and cameras, and monitors to help us do a better job of caring for our animals and ensuring their health and well-being?

Dee Shore (09:57):
In addition to finding out what stakeholders want and need from the Food Animal Initiative, a private firm looked into North Carolina State’s strengths in meeting those needs from a standpoint of both
facilities and faculty expertise. As with the Plant Sciences Initiative, the Food Animal Initiative has identified four focus areas, or platforms, that are key to moving the state’s animal industries forward.

**Todd See (10:24):**

It revolves back to some of the target areas I talked about, one of those being integrated systems of food animal health and food safety. Again, bringing interdisciplinary teams together to look at that and how we can enhance animal health and overall food safety for consumers by looking at not just the veterinary care of the animal but how nutrition, care and management, and early indications of disease can all improve those systems.

The others include digital animal agriculture, going back to precision ag. If we do a good job there, it’ll improve animal health. It’ll improve food safety because we’ll have better data, better decision-making tools, more rapid response. The third goes around the products, and this is perhaps one of the areas that we need to do more work on at NC State, and that’s protein innovation. How do we take these animal products and make sure that we’re delivering to consumers what they want in a way they want it?

Then obviously, our other platform is the one that’s most important to our stakeholders, and that’s working around food animal agriculture and communications. We’re not really saying that we need to do a communications campaign, but we need to make sure that people that are doing communications have the best available information, and we want to be a source for that and be able to deliver that to them in a way that they can use it.

**Dee Shore (11:57):**

Right now, See and others are taking several steps to move the initiative forward. These steps include building teams and high-level conferences around each of the platform areas, communicating the initiative plan and framework to stakeholders, and funding graduate students to work across both the College of Agriculture and Life Sciences and the College of Veterinary Medicine. Here’s See again.

**Todd See (12:24):**

We talked about the four big platforms, but there’s hundreds and hundreds of little details below that. What do we think about curriculum? How do we develop undergraduate programs? How do we actually manage and build these transdisciplinary teams? So we’re working through some of the details while getting feedback from all stakeholders, both campus and off.

**Dee Shore (12:46):**

See says that partnerships will be critical throughout all stages of the Food Animal Initiative.

**Todd See (12:52):**

We want to partner across departments and colleges and get a lot of campus involvement, but we also see this as a partnership with our farmers, our agribusiness community, our commodity associations, the Farm Bureau, the Poultry Federation, the Pork Council. We see this as large farms, small farms, sustainable agriculture, that this is a partnership across all fronts. Because if we’re not doing things together and making sure we’re doing what’s needed, it’s probably not as important and critical, and that’s really what we see this about – creating a big tent partnership and trying to answer questions people need done, and training people to lead into the future.
Dee Shore (13:35):
Like the Food Animal Initiative, the North Carolina Food Manufacturing and Processing Initiative is a partnership. It was forged by the North Carolina General Assembly in 2014, when the legislature provided funding to NC State and the North Carolina Department of Agriculture and Consumer Services. Again, the goal, Steve Lommel says, is to move the agricultural needle closer to $100 billion a year.

Steve Lommel (14:04):
North Carolina does a great job making fruits and vegetables and meat, but we lose a lot of the value, because what we do is we grow the stuff, then we send it to another state where they make something value-added about it, they make it into a processed food and do a final product, and really a lot of the financial value is after harvest.

The idea was to build this broad spectrum, fully functional laboratory, so our small food industries in the state can have a place to go to develop food after its harvest and develop products. They span from barbecue sauce, to power bars, to nutritional drinks, using North Carolina sweetpotatoes, North Carolina blueberries, and these kind of things, and keep the value here in North Carolina, and that is very exciting.

Dee Shore (14:59):
Also very exciting: the fact that a North Carolina food processing laboratory is now a reality. Delayed because of COVID-19, the North Carolina Food Innovation Lab recently became fully functional at its home on the North Carolina Research Campus in Kannapolis. The laboratory has state-of-the-art equipment to process grains, fruits, vegetables and raw plant materials into food products quickly, effectively, and safely.

The product development lab and test kitchen are staffed by food scientists who support formulation adjustment and sensory analysis to get the products tasting just right. Bill Aimutis, a nationally recognized leader in food processing, is director of the laboratory. He says the emphasis on plant-based products is strategic.

Bill Aimutis (15:53):
We were already a dominant player in animal-based foods, but when we started looking at the plant-based area, we realized that we grow a number of crops, about 85 to 90 different crops in the state. It made sense that we would become a dominant player also in the plant-based area. We have a lot of good ag research going on in the state. A lot of it’s plant-based already. The Triangle has been growing a little bit more in the ag and food technology space, and the centralized location in North Carolina to the East Coast, both directions, north and south, and then to the west, puts us in a position to reach about two-thirds of the population of the U.S. within a day’s drive.

Dee Shore (16:34):
Aimutis says the trend toward consumption of plant-based foods bodes well for the state. He sees tremendous potential for North Carolina to emerge as a major world center for food processing and food processing innovation.

Bill Aimutis (16:49):
I think we can put ourselves as one of the top food-producing and food-processing centers in the world. If you look today at where some of the really good vertical integration of technology through to
harvesting, through to food processing, through to consumer knowledge exists, there are only a few real solid corridors anywhere in the world.

Israel’s got a nice corridor developing. The Netherlands has a very nice corridor. I think California would like to try to make a play for it, but we all know some of the challenges of California with the water shortages that they’re facing and some of the other climatic problems they’re facing.

So as a result of it, I think North Carolina is in a better position. We have good soil, we have good water, we have several different climatic zones within the state that enables us to grow a number of different crops. And now, as we build out our food manufacturing initiatives and start increasing knowledge, even to the manufacturers that exist here in the state, through some of the training courses and stuff we’re putting together, five to 10 years from now, North Carolina will be recognized as a place for food technology, as well as for nutrition technology.

We want to make people proud of the fact that North Carolina, and North Carolina State University, and North Carolina Food Innovation Lab are trying to drive some of the change and advancements in the plant-based food world to make us be more recognized.

Dee Shore (18:17):

Aimutis says that with recognition will come economic growth, as well as better food for the state’s people, and that’s what the College of Agriculture and Life Sciences’ three initiative – plant sciences, food animal, and food manufacturing and processing – are all about.

[Music]

Dee Shore (18:40):

Thanks for listening today. We hope you’ll join us again for the next episode of Farms, Food and You. To learn more about the College of Agriculture and Life Sciences and our podcast, visit go.ncsu.edu/farms. While you’re there, share your thoughts. We’d love to get your ideas and to hear what topics you’d like for us to explore in the future.

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