

One-on-One with N.C. Agricultural Research Service Director Steve Lommel
Episode 16: Farms, Food and You Podcast

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Dee Shore (00:07):

For over 130 years, NC State University has been a friend to North Carolina farmers. It's educated the next generation of growers, driven prosperity through extension and outreach, and generated research that has improved how we feed ourselves. I'm Dee Shore from NC State's College of Agriculture and Life Sciences, and in this episode of Farms, Food and You, we visit with the man at the helm of the university's agricultural research enterprise, Steven Lommel, as he describes the work of the North Carolina Agricultural Research Service and what the organization means to farmers today.

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Dee Shore (00:54):

As a land grant institution, NC State plays a unique role in conjunction with North Carolina A&T State University in serving North Carolina agriculture and agribusiness. To achieve its mission, NC State's agricultural research casts a wide net. 320 faculty members support 600 active projects with the implications for nearly 90 farm commodities. For the last seven years, Steven Lommel has helped shape this work as associate dean of the College of Agriculture and Life Sciences and director of the North Carolina Agricultural Research Service.

Before that, he was a William Neal Reynolds professor of plant pathology. He studied how plant viruses move through plants to cause disease and ultimately explored the use of plant viruses to deliver drugs to treat cancer. His work then and now has had two goals – goals that drive NC State's agricultural research enterprise.

Steven Lommel (01:56):

We're very proud we're a land-grant institution. We're Think and Do. Thinking is discovery and research and the do is, "Let's figure out what to do with this discovery and solve a problem that's in North Carolina and in the United States and the world."

Dee Shore (02:12):

When it comes to agriculture, the focus starts with North Carolina, where the challenges are numerous and wide-ranging.

Steven Lommel (02:21):

North Carolina is a very dynamic state agriculturally. We have over 90 commodity groups. And so, our research enterprise is very big because we have to provide research services and solutions to all those commodity groups.

Dee Shore (02:36):

Those solutions have implications far beyond those commodity groups and the farmers they serve. Taken together, they take aim at problems so big they've been dubbed grand challenges. They address such areas as improving the health and productivity of crops and farm animals needed to feed a growing

world, understanding the potential impacts of climate variability and change and how to adapt to them, addressing issues of water quality and quantity, creating sources of sustainable bioenergy and securing the safety of our food supply. I asked Lommel about what he saw as some of the key challenges of importance to North Carolina farmers now and into the future and how the college addresses them.

Steven Lommel (03:27):

I'm going to tip my hat to extension as I give the answer because a lot of the issues in agriculture are being addressed and solved on the extension side, but certainly the adaptation of new technologies. The development of these technologies far exceeds societal acceptance. And we need to work hard in explaining, as scientists, the value and the dangers of these new technologies and the Genetic Engineering and Society Center addresses that point blank.

There's also a big issue in agriculture with a regulatory environment using ag chemicals and other types of solutions. And we're addressing that through CERSA, a regulatory center that's part of the Plant Sciences Initiative. Certainly, climate change is a major issue in North Carolina. It goes every which way. Some years, we have really bad drought; some years, we have too much water. And we're addressing that from a management point of view, an economic point of view, a genetic point of view, and a data analytics point of view.

There's also a lot of human issues in agriculture with the availability of getting labor. And I know our ag economics department and our Extension folks are looking at that. Also, looking at increased profitability. The fine line between a profit and a loss is very tight. One of our global goals is to stabilize profits year over year, so plants and agriculture and yields are more uniform under varying climatic conditions. And that's an integrative solution, it's a genetic solution, it's an agronomic solution, it's an economic solution, it's a human solution.

We're working on those big hairy problems. And then, the classic thing we've been working on for years: post-harvest loss, disease resistance, increasing yields, animal production, animal welfare, mechanization, robotics, all of these things are also relevant.

Dee Shore (05:44):

While the college pushes ahead with agricultural research, it's also pursuing a deeper understanding of life sciences, which are relevant to both agriculture and society.

Steven Lommel (05:57):

Some of the big things we're doing in the life sciences, we're certainly looking on the animal side, nutrition and reproduction. That's all pretty much animal physiology and animal genetics. We're looking at human obesity and metabolic diseases, like type two diabetes, using animal systems and using nutrition through our Plants for Human Health Institute down in Kannapolis. We're doing a lot of work on natural products and prebiotics. We're doing a lot of ecology at the climate scale and at the landscape scale, which means big ecology looking at states, and they're also looking at ecology at its much smaller scale: swamp ecology, lake ecology, agricultural ecology. Discoveries in that area can inform how to do agriculture.

Dee Shore (06:48):

When it comes to research successes, Lommel points to plant breeding programs that have led to such widely adopted varieties as the Covington sweetpotato and the Bailey peanut, and new foods, like Easy Eggs, as well as other food processing and food safety discoveries. He's also proud of NC State research

into gene editing, a way to make specific changes to the DNA of a cell or organism. Among other things, it promises to speed genetic improvement in crops.

Steven Lommel (07:21):

NC State is certainly on the map and is considered one of the leading institutions in the world on CRISPR technology. This is a specific type of gene editing technology that Rodolphe Barrangou was one of the co-inventors of – one of five or six co-inventors worldwide. This is an area where we are moving away from the discovery – from understanding the genetic and molecular mechanisms – to actually using gene editing in plants and animal systems to improve yield, create disease resistance and things like this. And we're actually now moving into the area of genetic-engineering-and-society type of questions. Will it be approved technology? Will people accept it? Is it considered the genetic engineering or not?

Dee Shore (08:08):

Barrangou and his colleagues at NC State have been involved in using CRISPR in a range of ways, from targeting disease-causing microorganisms to building better trees. NC State is also making significant headway in bringing together biology and engineering to develop new ways to use big data analytics and instrumentation to improve agriculture. And the university is at the leading edge when it comes to understanding the microbiome, the communities of microorganisms that live on, in or near plants, animals and people, and contribute to their functioning.

Steven Lommel (08:47):

The world is full of microbes – in the soil, the surface of the plant, your gut, the surface of your skin, and NC State has now 70 to 80 microbiologists universitywide, a lot of them in our college, looking at various aspects of the microbiome. We're doing very basic research on looking out how microorganisms communicate with each other through chemical sensing with other non-microbial organisms and understanding how these populations of trillions of organisms affect larger organisms like plants and animals.

A little story I like to tell is that, generally, most complex organisms, whether they're a plant or an animal, have around 30,000 to 50,000 genes. The current hypothesis is that you probably need about 250,000 genes to survive on the planet, to be able to break down food, to pick up nutrients and things like that. And that gap between what we carry around in our genome, in ourselves, where are those other genes coming from? They come from the microbiome that we carry around inside of us. On plants, that's in the roots and on the leaves. And these microorganisms need to work with these complex organisms to survive on the planet.

Dee Shore (10:11):

NC State's reputation in this area led in part to a \$30 million grant from the Novo Nordisk Foundation to study the role of microbes that interact with wheat. The goal is to make the crop more resilient against environmental stresses while reducing the need for chemical treatments and irrigation. To be successful with this project and others, the college encourages transdisciplinary approaches – ones that require teams of scholars who work in different areas, pulling together to tackle big challenges.

NC State's work on a major Plant Sciences Initiative and a new Food Animal Initiative both emphasize this kind of work. Lommel says that such approaches require diversity, and that's a college strength.

Steven Lommel (10:59):

It's very much a diversity culture. And what I mean by diversity is not only people, but a diversity of science, the diversity of representation, a diversity of crops, diversity of animals. Diversity, in the broadest sense of the term – that is something that we really take to heart and that is really critical to our mission.

Dee Shore (11:20):

One asset that allows for the diversity of agricultural research is a system of research stations owned and managed in a partnership between the university and the North Carolina Department of Agriculture and Consumer Services. Lommel says the stations are essential to helping scientists take what they've learned in the laboratory and test it under real-world conditions.

Steven Lommel (11:43):

NC State is exceptional at doing delivery kind of research. A lot of that has to do with our research stations and field labs throughout the state. We have a very large Extension program, too, and we partner very closely with Extension. But North Carolina is a very dynamic state with mountains, Piedmont and coastal, and many different soil types, so maintaining this robust system of research stations is really important to be able to serve and satisfy all those different regions. It also provides us a leg up for field research, as well.

Dee Shore (12:21):

Another asset that the college brings to bear in its research is perhaps the most important, the people who discover new knowledge, teach it and apply it to today's challenges. Lommel was proud of the college's efforts to hire a new generation of researchers and other faculty members. Many replaced retiring faculty members, but some positions were created through the Chancellor's Faculty Excellence Program and other efforts. In all, 130 new faculty members have been hired.

Steven Lommel (12:56):

Over a third of our faculty are new within the last three years. I don't know of any other land-grant institution in the country that has done this much hiring in this concentrated amount of time. And for us, it's a real reboot. We've been very deliberative about hiring faculty who are collaborative and are willing to work together, not to be isolated ivory towers. And it's hard to overemphasize the transformational feature that these new faculty are bringing to us. They're young. They're exciting. They have 25, 30 years of a career ahead of them at NC State University. We're going to reap the benefits of these hires for decades to come. I'm really proud of rebooting our human talent and growing the college.

Dee Shore (13:51):

Faculty members are instrumental in carrying out the university's three-part mission of teaching, extension, and research that advances North Carolina's economy and its quality of life for the benefit of the state and all its people. As director of the Agricultural Research Service and associate dean of the College of Agriculture and Life Sciences, Lommel takes that mission to heart.

Steven Lommel (14:17):

The research enterprise, and I can speak for the whole college, is here to serve all stakeholders in the state, urban stakeholders, agricultural stakeholders, organic stakeholders. And we provide solutions and advice in all areas of agriculture, whether it be vertical farming, local foods, very large 10,000-acre integrated farms. We're here to provide solutions and science and recommendations for everybody.

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Dee Shore (14:55):

Thanks for listening today, and 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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