

2011 Clemson Annual Convocation Ceremony Keynote Address

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“The Agricultural Research Agenda for the 21st Century.”

Thank you Dean Scott for that kind introduction. Convocations are always exciting days on campus, full of pomp and circumstance, but also full of great hopes for the future. I’m honored to be here today with members of the Clemson family, to share my enthusiasm for the future, which includes the next generation of agricultural and natural resource scientists. I thank you faculty for helping educate them. Education isn’t a static process. It takes an ongoing commitment to learning and striving for excellence, and Clemson is a thriving example of that commitment.

There couldn’t be a more appropriate place to talk about the future of food than Clemson – a university that was a gift to the world of agricultural research from a man who was a founding father of our nation’s agricultural infrastructure.

Thomas Clemson had a real vision that saw the need to support farmers and provide education to citizens of South Carolina. Today, I want to emphasize the

urgent need to *reaffirm* our commitment to agriculture, science and education, which are the foundations that will allow us to innovate and meet the challenges of the future.

When I speak of agriculture, I'm using a broad definition that encompasses the traditional agriculture and forestry disciplines as well as human nutrition and food science.

In 2012, we will have a chance to publicly celebrate that commitment, when we mark 150 years since President Lincoln signed the Morrill Act, which created the land-grant university system, of which Clemson is a part.

Through this Act, Lincoln forged an agreement – a compact – between the federal government and the states that opened the doors of education and established access to public higher education as a foundation of American Democracy.

The Morrill Act not only revolutionized American education and agriculture, but transformed the Nation's economic and social fabric.

Since then, our state colleges and universities have graduated more than 20 million students, produced countless scientific breakthroughs, vastly increased agricultural productivity, and improved the lives of people everywhere.

And Thomas Clemson was a visionary in his anticipation of the land-grant system.

As early as 1856, living in Prince George's County in Maryland, Clemson advocated for the establishment of an agricultural college, supporting the creation of what today is the University of Maryland.

As the United States Superintendent of Agricultural Affairs in the Buchanan administration, Clemson supported the donation of federal lands to the states to establish colleges for the study of agriculture and the mechanical arts.

But Clemson was also a visionary in recognizing the fundamental importance of agriculture science and education to our general welfare.

More and more these days you see a growing recognition that agriculture and natural resources are at the crossroads of the world's most critical problems: sustainable food production, providing clean and abundant water, responding to

changes in weather and climate, increasing access to renewable energy, and improving human health. Drought and flooding, land use changes, population growth, and emerging pests and plant and animal diseases are placing intense pressure on the world's food and agricultural system and threaten the future availability of sufficient food supplies. At the same time, there is a growing recognition of the importance of water conservation, with 87% of America's surface-derived drinking water coming from farms, ranges and forests.

To me, these problems are societal challenges that we know from history can lead to domestic and international conflicts. Making sure we can provide the safe, nutritious food and clean water needed to support an ever-growing domestic and global population is not going to be easy given the ever-increasing estimates of where global population is headed. Feeding the world, and doing it in a sustainable manner, with farmers getting a fair return, is a challenge that we will all have to pull together to face. This is now a global problem, and it's going to require a global solution.

As a scientist, I know that the research we need to address global food security can't wait. Research takes time, it takes long-term funding, and it takes a work force educated enough to do it. I see a large part of my mission as USDA's Chief

Scientist as moving the ball forward on all of those areas so that our nation can continue to be a leader in science and help the world address the challenges that lie ahead.

And as Under Secretary for Research *and* Education, I can't emphasize enough the importance of recognizing the complementary roles of universities and federal labs in addressing the food security research agenda.

The challenges facing agriculture, natural resources and conservation are immense, and need to be faced with the most robust research enterprise we can muster.

We have every reason to embrace, engage, and celebrate the partnership that has made modern agriculture productive and profitable. But as we look forward to celebrating 150 years of the land-grant university system in 2012, we need to do more than reflect on how well this partnership has served us. We need to renew, reinforce, and reinvigorate this partnership – and then some. We need to reinvent and re-imagine what a research and development partnership between the states and the federal government that was established in the 19th century would look like if we were to create it from scratch today, in the 21st century. And we need to craft a new compact with America – its states, its agricultural producers, its

consumers, and its colleges and universities – to bring into being a new agricultural enterprise capable of feeding and fueling America and the world in the decades to come.

From my perspective, a 21st century research compact will be built on three important components: competitive, peer-reviewed research grant making; coordinated and interwoven with a strong federal intramural research program; and leveraged against the incredible infrastructure, expertise, and intellectual capacity of our state land-grant university partners supported, in part, through state and federal funds.

Competitive, peer-reviewed research is at the heart of the new compact – at the National Institute of Food and Agriculture we are systematically rebuilding a new competitive grant system modeled after the best practices employed by NIH and NSF – widely regarded as our premier science agencies. This grant system tracks with the changes in the 21st century biology landscape and other sciences by emphasizing team-driven, multi-institution research; multi-disciplinary and interdisciplinary approaches; and larger grants over longer terms than NIFA's predecessor CSREES provided.

While competitive grants are central to our strategy, the federal government has a unique responsibility in this new compact: intramural research capacity also needs to be sustained to undergird and complement competitively funded extramural research. Especially in times of tight budgets, we will have to work in a coordinated, integrated way, leveraging the strengths across government of scientists and those in the universities, to make the strides we need in an efficient and effective way.

At USDA our intramural research programs will focus on the uniquely governmental concerns and scientific needs of USDA agencies, and steward specialized data sources and collections that no one else can provide.

We'll also focus on research that helps coordinate a national perspective or framework, creating a single standard that others can use.

And we'll do what publicly funded research has always done best – the research that addresses the most pressing questions facing our food and agricultural concerns, especially when the country needs a quick response to health, safety, or policy challenges.

Publicly funded scientists – working in university settings and in national laboratories – have the advantage of being able to focus their work on those areas that are public goods and less likely to provide a return on investment for stockholders, like scientists in the private sector do. Their focus can be on areas that involve the fundamental research that the private sector either can't afford to do, or won't do because it doesn't provide obvious profits. With publicly funded research, the entire country – and the world – reaps the benefits.

The Economic Research Service recently released a study on the importance of publicly funded agricultural research. It's long been known that the agricultural sector has proven to be a net positive for our trade balance, going back as far as the 1960s. But this study shows a correlation between investment in agricultural research and agricultural output. That's a key goal to keep an eye on if we're going to keep feeding the world.

The report finds that:

- With no spending increases, growth in agricultural productivity could drop to half of its current level over the next 40 years, requiring the U.S. to devote far more land and other resources to farming in order to meet increased

demands, thereby raising food prices and increasing environmental problems;
and that

- Increasing spending along with and in proportion to either inflation or U.S. population growth, U.S. agricultural productivity would increase slightly below and above current levels (respectively), allowing U.S. agricultural output to keep pace with projected increases in domestic and world demand.

This report really raises the alarm on the importance – even in times of tough budgets – that we not be penny-wise and pound foolish when it comes to funding agricultural research.

Results such as this study's give added urgency to the need for our state partners to be fully vested co-creators and signatories to a new agricultural research compact. The success of American agriculture to date can be attributed in large part to how well the relationship between the states, the land-grant universities, and the federal government has worked in the past 150 years.

One of the things that bolsters my confidence in our ability to write a new compact for the future of agricultural research today is the strong support we have in Washington and throughout the country. President Obama and Secretary Vilsack share my commitment to science: they demonstrate daily their interest in and commitment to science and research leadership. And in Congress, our science has been the beneficiary of decades – generations, really – of vision and leadership.

The land-grant community, producers, and consumer groups should all arrive at a shared vision for what a Morrill Act of 2012 would look like. I look forward to hearing your thoughts and suggestions as we move forward with crafting the new compact for the future.

But even with these pieces in place, the most important element in this whole picture is incomplete.

To ensure food security, innovation and sustainability for years to come, we need to be recruiting and training the talent today to ensure success tomorrow. Some call this the education pipeline, and specifically, the science, technology, engineering and mathematics, or STEM, education pipeline.

Some countries, like Korea, China and Brazil, are making important investments in STEM education, but our support for it here at home is lagging. This is a very serious concern of mine, both as a former Dean of Agriculture at Iowa State, and in my current role at USDA, where I see the value of STEM education every day in research being done by our scientists, economists and statisticians.

It's great that other countries are making important investments in STEM education. In the past, such students have often come to the United States for higher education, and now they are increasingly staying home. While we want to encourage those students to continue to bring their talents here, we also have a large untapped pool of homegrown talent.

Soon, we'll have concrete data to help us chart exactly what the status is of that pipeline of students in the food and agricultural and natural resource sciences.

APLU, the Association of Public and Land-Grant Universities, has agreed to work with us on an analysis of the landscape of students and their scientific education.

They'll be assessing the flow of students through the "pipeline" of science, from K-12, through undergraduate and graduate education. Their findings will let us know exactly what the situation is, so we can design strategies to shore up the

supply of students educated in science and ensure they get the advanced degrees they need.

I know the Clemson community has been doing its own future planning and has recently completed a Road Map to 2020.

As we all know, current planning efforts are requiring us to figure out how to do more, and do better, with less.

I believe the best way to accomplish this is to invest in science, and the research and development that will generate the innovations that help us grow.

This means, we need to renew our focus on STEM – science, technology, engineering and math – education. This also means we need to tap into areas of potential growth. Agriculture is particularly important here.

Statistics show that the federal government currently spends about 4 % of its total K-12 education investments in STEM Education. That investment doesn't reflect the importance of STEM education to our future workforce.

If we can keep sending out the message that agriculture is at the heart of answering the many challenges we face and of keeping our economy strong, I believe we can attract the best talent of the next generation to the food, agricultural, and natural resources sciences.

Right now, the best press science careers get is on television, in shows like the CSI series. But I think we have an obligation to educate the public – parents, teachers, and young people – on the fact that there are lots of interesting and exciting ways to have a career using science. And there is a wealth of jobs to be had.

According to the US Department of Labor, 15 out of the 20 fastest growing occupations require significant science or mathematics training to successfully compete for a job. They also found that professional information technology (IT) jobs will increase by 24% between 2006 and 2016. However, as jobs requiring a solid STEM background are growing – more students are choosing not to major in these areas.

It is being projected that by 2010-2015 there will be about 55,000 jobs available for agriculture graduates, but only about half of these will be filled by graduates in this discipline, and the other half by allied disciplines.

Compounding the challenge of interesting young people in science careers is the fact that we also have fewer teachers qualified to teach science and math (particularly at the K-12 levels). Other challenges include a lack of student preparation for college-level STEM coursework, and the availability of sufficient access and financial support for students to attend college at all.

These factors affect underrepresented groups the most, especially as they move further along the pipeline, and if we don't address this it is going to become an increasingly serious problem.

Part of the issue is that while the demographics of our country are changing, underrepresented minority group participation in STEM fields is not keeping pace.

By 2050, minority groups are projected to comprise more than 50% of the population with the fastest growth coming from the Hispanic population. If this trajectory continues over the next 40-50 years when it is predicted that the term "minority" groups will be questionable since these groups will represent more than 50% of the U.S. population, then we are on pace for a workforce shortage,

particularly for jobs that require strong technical skills - which is what is needed to work and live in the 21st century.

We need to ask ourselves: are we preparing everyone for the task at hand? Will we have a sufficiently trained workforce to take the responsibility for the challenges that face our country? And will we have enough students adequately educated to be competitive in the future job market in the United States and able to deal in a global work environment? Who will become the next generation of leaders in the STEM enterprises of this country? These are questions we can't answer anything but "yes" to, though it will take a concerted effort on all our parts to lead to the "yes."

At USDA we try to address some of these issues by providing support for projects that may attract, enroll, and retain more students into agricultural STEM disciplines at various academic levels while supporting diversity, as well as support the training and development of faculty members from different types of institutions including K-12 levels.

USDA however cannot solve the education pipeline problem by itself. To be successful moving forward we will need each other's continued support, and we need to raise a wider awareness of the importance of this issue.

I know everyone here understands the importance of that mission, and I appreciate your being part of the team. Teamwork, mentoring, and collaboration are so important to developing the next generation of scientists. It's something we've all experienced at some point in our careers. And it's a legacy we need to pass on.

I'll close by recognizing the outstanding Clemson faculty and staff here for your important work in continuing that legacy of teaching, mentoring and academic support. The work you do is at the heart of this vital task.

I also want to challenge students here today to consider how *you* will address the grand societal challenge of your generation – food security.

By keeping our eye on the goal of fostering a healthy and robust education pipeline, we can ensure that 21st century America is well nourished, that our farmers are prosperous, and that world hunger will one day be an issue we can see in the rear view mirror and say we've beaten. I believe, if we continue supporting food,

agricultural and natural resource science; vibrant, contemporary extension programs; and educating the next generation of American researchers, we will get there.

So as you begin your new academic year, I hope all of you continue to have faith in our ability to accomplish our goals and overcome the challenges we face. Like the example set by Thomas Clemson many years ago, if we set the educational groundwork today, we will prosper tomorrow. Thank you.