

Proceedings of the 2015 AAAS Charles Valentine Riley Memorial Lecture

# A University President's Perspective on the Economic Importance of Pursuing a Unifying Message to Make Agriculture a National Priority

Organized in collaboration with the Charles Valentine Riley  
Memorial Foundation and the World Food Prize Foundation

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# Foreword

“Without food, man can live at most but a few weeks; without it, all other components of social justice are meaningless.”<sup>1</sup>

– NORMAN BORLAUG’S NOBEL LECTURE, 1970

We were reminded of Dr. Borlaug’s sage words by Dr. Steven Leath, the 2015 AAAS Charles Valentine Riley Memorial Lecturer. Dr. Leath went on to say that if we continue to take our food and water supply for granted, “not only will a food-emergency be nearly inevitable, but the economic consequences will be grave... and this won’t be a ‘third-world problem,’ it will be a worldwide problem...even a main street U.S.A. problem.”

Two central themes emerged from this year’s lecture and panel discussion that followed. The first is that the level of federal spending on food, agriculture, and natural resource issues is not nearly adequate to address the looming crises of population growth, climate change, and others. The second is that it is imperative for all interested stakeholders to find common ground to create a cohesive message that speaks on behalf of the entire agriculture enterprise.

Our distinguished panel agreed that if support for increased agricultural research funding is to be a national priority, the ‘unified’ message needs to resonate with both policymakers and the public in a clear and decisive way that shines a light on the challenges that will undoubtedly arise from stagnated funding and continued inaction.

On the pages that follow, you will find the text of the 2015 AAAS Charles Valentine Riley Memorial Lecture, selected highlights of the panel discussion, as well as information on federal funding for research in this area. The table and analysis included present updated figures from the chapter on “Agriculture and Natural Resources” in the *AAAS Report XL: Research and Development FY 2016*. We thank the authors for their contributions to this section and to the overall report.

Finally, we recognize and thank our colleagues at the Charles Valentine Riley Memorial Foundation and the World Food Prize Foundation for their substantial input and to our sponsors for their continued investment in this important discussion.

I hope you will find these proceedings interesting and useful.



Rush D. Holt  
Chief Executive Officer, AAAS, and  
Executive Publisher, *Science* Family of Journals

<sup>1</sup>[http://www.nobelprize.org/nobel\\_prizes/peace/laureates/1970/borlaug-lecture.html](http://www.nobelprize.org/nobel_prizes/peace/laureates/1970/borlaug-lecture.html)

# Acknowledgements

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Iowa State University; President, Charles Valentine Riley Memorial Foundation

We would also like to recognize and thank the following sponsors for their generous support of this year's lecture:



# Table of Contents

|  |    |
|--|----|
| A University President’s Perspective on the<br>Economic Importance of Pursuing a Unifying Message<br>to Make Agriculture a National Priority ..... | 2  |
| Panel Discussion Highlights .....  | 9  |
| Participant Bios.....  | 11 |
| Federal Food, Nutrition, Agriculture, and<br>Natural Resource Sciences Funding Update .....  | 13 |
| About Charles Valentine Riley .....  | 15 |
| About the Lecture and Partner Organizations.....   | 17 |



# A University President's Perspective on the Economic Importance of Pursuing a Unifying Message to Make Agriculture a National Priority

## Steven Leath

President, Iowa State University

Good afternoon and thank you! I want to start by saying what an honor and a privilege it is to be invited to present the 2015 AAAS Riley Memorial Lecture. In particular, I'd like to thank Rush Holt, chief executive officer of AAAS, and all of his staff. Also, Dick Ridgway, past president of the Riley Memorial Foundation, and current president Wendy Wintersteen, endowed dean of the College of Agriculture and Life Sciences and director of the Iowa Agriculture and Home Economics Experiment Station at Iowa State University. She has, and continues to be, one of the strongest leaders and advocates for agriculture and agricultural research across Iowa and the nation.

I also want to recognize Ken Quinn and the World Food Prize Foundation for their collaboration in creating this wonderful opportunity to highlight research and innovation in agriculture. Iowa State is proud to have a strong relationship with the World Food Prize, located in Des Moines – just 30 miles from our campus in Ames. I want to thank USDA Under Secretary for Research, Education and Economics Catherine Woteki who is also a former dean of the College of Agriculture at Iowa State for her dedicated leadership to advancing agriculture.

And I want to thank all of you for being here – because we cannot solve the world's and agriculture's grand challenges without all of you.

About seven months ago, a comprehensive report was released entitled – *Pursuing a Unifying Message*. The Riley Memorial Foundation led the effort and both Dr. Ridgway and Dr. Wintersteen were among 40 contributors and reviewers of the report. The purpose of the report is to underscore the critical need to elevate food, agricultural, and natural resources research

as a national priority. And it stresses that the way to accomplish this is by coming together with one voice to speak in a clear, effective, and compelling way about why ag research is so essential to the public good.

Former U.S. Secretary of Agriculture Dan Glickman wrote the foreword for that report. And last year at this lecture, in advance of the report's release, Secretary Glickman laid out some of the key reasons for why agriculture should be a national priority. He emphasized the monumental mission we're on to meet the needs of a global population as it rapidly expands to 9.6 billion people by the year 2050.

He referred to the obstacles we face as the asteroids of the future – the need to produce as much food in the next 35 to 40 years as the world has produced in the previous several thousand, and how this is compounded by the fact that we have diminishing land and water supplies and an increasingly volatile climate.

### **Greatest mission in the history of agriculture**

Today, I echo that message – and I would add that this is not only the greatest mission in the history of agriculture, it is indeed the greatest challenge in all human history! Given that, as the days, months, and years pass, the urgency with which we must address this challenge only intensifies.

The vast majority of the population growth by 2050 is projected to occur in areas already experiencing food insecurity; Sub-Saharan Africa's population could more than double. But the challenges of 2050 aren't confined to developing countries – the impacts will be felt worldwide and right here in the U.S. The projections are staggering – the amount of farmland available to feed

each person will shrink from nearly a full acre 25 years ago, to less than a third of an acre per person in the next decades, and nearly half of the world's population is projected to face water scarcity by 2050.

Yes, this is quite clearly a serious humanitarian issue, but I also want to stress why this is an extremely important economic issue and how universities must contribute to both — and be part of the compelling message to increase support for ag research and innovation.

My perspective is certainly influenced by my position as president of a leading land-grant university that is also a member of the Association of American Universities. Iowa State is home to a College of Agriculture and Life Sciences ranked in the top 10 in the world... it's the university that pioneered the nation's first cooperative extension program... it's a university that focuses on partnerships as well as innovation to advance agriculture... and it's a university that understands the critical need for a unifying message.

But I'm not only president of Iowa State, I'm also a trained plant scientist. I earned my undergraduate and master's degrees in plant science. I actually conducted my master's thesis on soybean diseases, and I earned my Ph.D. in plant pathology studying genetics of disease resistance in corn. All of my degrees are from land-grant universities — Penn State, Delaware, and Illinois.

And following my education, I traveled to Mexico as a USDA-ARS scientist and walked the same fields as one of the greatest agriculturalists of all time, Iowa-native Dr. Norman Borlaug. Not only did I work in the same fields in Texcoco and Obregon, I had the distinct pleasure of meeting Dr. Borlaug on a few occasions. I'll never forget our conversation when he said he couldn't have had the success with his wheat varieties without face-to-face conversations with farmers. That reconfirmed for me the very real impact of extension programs, of not just conducting groundbreaking research but ensuring that the results of that research are made available to those who have use for it.

As a plant pathologist with the USDA-ARS unit based at NC State and a young professor, I focused on disease control and genetics of disease resistance cereal crops. Later, I was promoted to research leader

and then acting national grain crops program leader for the ARS unit in D.C. I developed a deep appreciation for ARS research because it serves a wide range of stakeholders, it's unique and it complements university and private sector research, and its primary objective is to contribute to the public good.

The base funding that accompanied these positions allowed ARS scientists to react quickly to emerging needs and conduct research to develop high risk/high payoff solutions.

More recently, before joining Iowa State three and a half years ago, I served as Vice President for Research for the University of North Carolina System and I had active roles at the NC State Centennial Campus and the North Carolina Research Triangle Park. This is where I realized the important benefits of putting a major focus on public-private partnerships.

### **Message: Elevate food, agricultural and natural resources research**

So, I tell you all of this — not to boast my resume, but to give you a better understanding of my experience and how that has shaped my broad perspective on why we need to partner together and not only pursue, but actually develop, a unifying message to elevate food, agricultural, and natural resources research as a national priority.

I often tell audiences that “I'm a land-grant guy.” I am, always have been, and I'm very proud of that — and I will speak to that. But as we think of a unifying message to rally around, I want to acknowledge that the engagement of many public universities, both land-grant and non-land-grant, and private universities will be necessary in moving forward.

The universities will need to be in close partnership with ARS as well as other federal and state agencies and the private sector if we are going to succeed. Land-grant universities have their roots in agricultural research, going back over 150 years. Other universities bring critical expertise and experience to address challenges in agricultural sciences. We must value all contributions from diverse institutions and partners and think about how we move forward together on this critical national priority.

As a “land-grant guy,” I certainly believe the legacy of success of the land-grant system strengthens our case. Land-grants were founded on the principles that higher education – focused on core, practical subjects like agriculture – should be accessible to all. They were also created to conduct research on real-world problems and share that research to benefit the public good and improve quality of life.

You can’t get more “real-world” than a burgeoning global population that faces the threat of an insufficient food supply caused by a lack of land, water, and unpredictable climate change. The innovations that originated from land-grants like Iowa State have fundamentally transformed the ag industry.

Every university involved in food, agricultural or natural resources research – whether public or private – can point with pride to its accomplishments that have strengthened our nation. For Iowa State, one of the most groundbreaking agricultural advances was the development of hybrid corn, and specifically B73. It was recently named a Top 40 university innovation because the inbred line was instrumental in the increase of corn yields from about 20 bushels per acre in the 1930’s to more than 170 bushels per acre last year. This innovation was the culmination of decades of collaboration between the university, state, federal, and private partners. The stiff stalk synthetics are an Iowa original, but they’re now global – used in corn breeding programs worldwide, including the U.S., China, Argentina, and Italy.

It is innovations such as this that helped the U.S. enhance its status as an ag powerhouse. But in the years since, we’ve become complacent, while countries like China and Brazil have become hungry for innovation. Six years ago, China overtook the U.S. as the global leader in public spending on agricultural research by tripling its investment. India and Brazil have also sharply increased their spending, while U.S. investments in ag research have declined 16 percent in the past decade. There is great concern that the U.S. is idling on an innovation plateau, while China and other countries are accelerating their efforts.

### **Investing in U.S. agriculture**

For U.S. agriculture to avoid losing its competitive edge and for our agricultural system to continue to operate successfully into the future, we need reliable and growing levels of federal funding for research. It is so important to look at all federal sources of investment, whether that’s within multiple agencies or across agencies, and whether it’s dollars invested in competitive research programs... or dollars invested in the infrastructure that strengthens our capacity to respond quickly to emerging issues. The United States has the world’s premier research enterprise in food and agricultural sciences. But changes need to happen to maintain our leadership.

Investing in the future of agricultural science requires an expanded portfolio of basic and applied research and extension and education – and continued investment in both competitive funding and capacity funding.

The lagging federal investment in food and agricultural research presents a tremendous dilemma for universities. As I said earlier, we’re proud that Iowa State is considered one of the very best universities in the world for agricultural programs. There are excellent agricultural programs at universities across the country. And we’re all very competitive. We all want to hire more of the best and brightest minds to face these enormous challenges in food, agriculture and the environment. But how do we support them in the future? Where will the resources come from to ensure they are successful and, in turn, these essential societal needs are met? This is a dangerous path we’re on. If we continue down this road, it is inevitable that our food, agriculture, and natural resource priorities will suffer.

Additionally, as a land-grant president, I recognize the requisite relationship and balance between competitive funding and capacity funding. It is difficult to imagine the nation dealing with a significant, immediate food or agricultural challenge without capacity funding. And it is impossible to imagine through a competitive grants program. Capacity funding is vital to a university’s operation and it also has made ARS a great organization. It supports faculty, staff, and scientists who are in position to quickly address challenges and crises when they arise.

## Responding to avian flu

Take the recent avian influenza outbreak for example. As the nation's leading egg producer, Iowa is bracing for a potential billion dollar economic hit. Nearly one in five eggs consumed in the U.S. comes from Iowa, and so far, our producers have lost more than 30 million egg-laying chickens or about a third of their flock. And while egg prices are increasing for you at the grocery store, there's also increasing concern among egg and poultry producers that they won't be able to weather the outbreak, meaning many Iowa jobs may be at risk.

Fortunately Iowa State University has the base support to respond to this type of agricultural emergency. Our university is home to the Egg Industry Center – and the director, Dr. Hongwei Xin, is supported by capacity funds.

He and other university experts have been instrumental in providing valuable knowledge and resources to assist and educate poultry and egg producers as well as the general public about the outbreak – underscoring the critical need for our expertise and our cooperative extension services, which ensure our science-based solutions are shared with those who need them. This is but one agricultural economic crisis, without capacity funding many other billion dollar incidents will occur.

But our response doesn't end there. Iowa State also has a team that had been collaborating with a company located at the Iowa State Research Park, Harrisvaccines, along with the USDA on avian influenza well before this outbreak even began. And because that partnership was already in place, they were able to react quickly to develop a prototype vaccine for testing against this new strain of the disease. This is a wonderful example of how our mission of education, research, and outreach is making a very real impact on society.

In addition to being a land-grant guy, I'm also an APLU and an AAU guy, and Iowa State is proud to be a member of these organizations of leading research-intensive universities. The AAU universities do incredibly important work in agricultural sciences, and they compete extremely well each year in the USDA's National Institute of Food and Agriculture competitive grants.

Over the past four years, 36 percent of NIFA's competitive awards went to AAU member universities – both land-grants and non-land-grants. At Iowa State, we've used recent NIFA support to greatly advance understanding of climate change and develop future Midwestern cropping systems. Other AAU members are using NIFA support on major efforts to address obesity prevention in the Southeast... to build up advanced hardwood biofuels industry in the Pacific Northwest... and to help ensure food security and access to healthy foods in Michigan. The point is: we can't do this with just the land-grants, we must be more inclusive.

You're likely familiar with the numbers – but it bears repeating. For every federal dollar spent on agricultural research in the U.S., nearly \$13 is spent on medical research. The USDA's research budget is just shy of \$2.4 billion dollars. NIH's budget? More than \$30 billion! And yes, finding cures for diseases is unquestionably important – they deserve every penny. But I ask you – shouldn't we also be growing our investments in research that may prevent those diseases in the first place... through proper nutrition and access to high-quality food and safe water?

## Communicating to policymakers

We need to do a better job of communicating the message to our policymakers that even if we cured cancer today – without food, the longest any of us could survive is about three weeks. Without water – about 3 days. These aren't just statistics; they're very real fears, particularly in the developing world.

We may think that the public, and in particular, policymakers should intuitively understand just how essential this research is since everyone needs water and food to survive. Certainly the medical and health entities are doing a much better job of connecting the results of their research to your quality of life. And it shows in the federal investments.

Dr. Borlaug may have put it best in his 1970 Nobel Lecture. He said – *“Without food, man can live at most but a few weeks; without it, all other components of social justice are meaningless.”*



Another Nobel Laureate, John Boyd Orr put it even more simply – “You can’t build peace on empty stomachs.” And I would expand on that to say you can’t end cancer, eradicate AIDS, fight Alzheimer’s, or cure the common cold on empty stomachs either. Further, it would not matter to those individuals if they are without food.

But what makes developing this unifying message so challenging is that very few, if any of us, have ever personally experienced a severe food-emergency. However, it’s almost certain that we know someone who has battled a chronic illness such as cancer, ALS, or heart disease... maybe it’s even you. That personal connection makes it easy to understand, accept, and support medical research, but making the personal connection between agricultural research and innovation and the ability to feed your family dinner tonight is much harder to convey.

Nonetheless, I can assure you if we continue to take our food and water supply for granted, not only will a food-emergency be nearly inevitable, but the economic consequences will be grave.

Just take a look at California, an area where these issues are already emerging. That state is experiencing one of the worst droughts on record, forcing the Governor to mandate a 25 percent cut in water consumption for urban areas. But despite this grim situation, most people can still flip on their faucet for fresh, clean drinking water at their disposal. This is case in point why we must do a better job of personalizing these sorts of problems in order to secure support for long-term solutions. With billions in losses now predicted, the economic impact of the drought is severe.

And it’s important that these solutions are long-term, not a one-time fix. We need to develop innovations that can advance and sustain agriculture long into the future. One of those emerging areas is Big Data analytics. Big Data combined with GPS and high-tech sensors is enabling California farmers to map out their fields to better understand soil conditions and better manage their water supply. Right now, many farmers are subsisting by tapping into the groundwater supply. But that supply is quickly diminishing. This innovation will not only enable them to endure the drought, but also

make permanent changes in how they manage their water supply for the future, which may prevent a future emergency.

Big Data is one of several rapidly emerging areas where Iowa State University is having a major impact on meeting the challenges of 2050. I mentioned those “B lines” of corn earlier. Today, our “Big Data” scientists are partnering with other universities and the private sector to develop a maize phenotype database — a resource that will harness the enormous amounts of data from the sequenced corn genome. In essence, it’s the beginning of deciphering the corn genome, allowing researchers to leverage the knowledge to make potentially dramatic genetic improvements in corn.

We’re also leading the way in advances in agricultural biosciences, biorenewables, biotechnology, and advanced manufacturing. And through an initiative called the Cultivation Corridor that I co-chair – we are bringing together experts in these fields – from both the public and private sectors to make Central Iowa the agbiosciences capital of the world.

You might consider this our answer to California’s Silicon Valley or North Carolina’s Research Triangle. And now I believe this can serve as a local example, a microcosm if you will, of how we can come together nationally to reclaim the U.S.’s global leadership in agriculture.

### **Cultivation Corridor**

The Cultivation Corridor will soon be based at the Iowa State University Research Park, which is currently home to more than 60 companies and 1500 employees. Over the next decade, we plan to triple the size of the park and the number of employees. The purpose of the park is to provide an incubator for new companies and assist established companies by connecting them with our workforce, researchers, innovations, and capital. The result – we’re able to accelerate commercialization of our research, promote entrepreneurship, and create jobs.

Several studies have shown that every dollar invested in agricultural research creates \$20 in economic activity, which means we’re not only positioning ourselves to help solve potentially paralyzing problems such as food waste, climate change, and pest management, we’re

also positioning ourselves to advance Iowa and the nation's economy.

Since its official inception just over a year ago, the Cultivation Corridor has totaled more than \$1.8 billion in investments and economic activity. These are the types of investments needed throughout our nation if we are going to be successful meeting the obligations for 2050.

Key to the success of the Cultivation Corridor is a multidisciplinary approach and a strong emphasis on public-private partnerships. And we've experienced great success so far with companies such as NewLink Genetics, a firm that has made global headlines for its work on cancer and Ebola vaccines; Boehringer Ingelheim – one of the world's largest pharmaceutical companies – is building its new global animal health R&D facility at the ISU Research Park; and Harrisvaccines – which, as I mentioned earlier, is working with Iowa State on avian influenza.

In addition, the Cultivation Corridor is already home to some of the top agricultural companies in the world – John Deere, Pioneer, Monsanto, Kemin, ADM, among others – and through this initiative, we are becoming better connected and better organized to address our greatest agbio challenges. These types of partnerships exist elsewhere like the Research Triangle Park; but we need to not only work together, we need to advocate together.

It's that type of connection and organization that is vital to our national pursuit for a unifying message – because individually we are good, we're conducting strong research, we're making important advances; but, and forgive me for sounding trite, we must remember the tremendous strength in numbers.

Earlier this spring, a group of university leaders, along with representatives of the Association of American Universities, the Association of Public and Land Grant Universities, and the Non-land-grant Agriculture and Renewable Resource Universities gathered for a focus group on how to pursue a unifying message. A report that summarizes their discussion will be released tomorrow by the Riley Memorial Foundation. University of Illinois President Emeritus Bob Easter was part of that group, and I was not surprised to learn that as a university president with an agriculture background, he feels the same way I do.

We both feel strongly about the need for broad engagement with both public and private entities, the significance of sustainability, and the importance of finding common ground to craft a message that will resonate with both policymakers and the public. I believe this is the strategy we need to secure an increase in funding across the board.

Each institution, each organization, each company with a stake in food, agriculture, and natural resources has a powerful perspective. But right now, agriculture and food research interests are viewed as one of the least effective groups in Washington. Why? Because there are too many messages out there focused on narrow interests.

We need to step outside of our silos and realize that by joining forces, it not only makes our research more powerful and our efforts more sustainable, but it will make our unified request to increase investments more persuasive and compelling.

So just how big of an increase are we talking? Three years ago, the President's Council of Advisors for Science and Technology (PCAST) recommended boosting federal funding for agricultural research by \$700 million.

Just last month, the Chicago Council on Global Affairs recommended the U.S. double its investment in agricultural and food research over the next 10 years. While to some this may sound like an extreme request or a lofty goal, I would argue that recent trends in federal funding tell a very different story.

Between 1990 and 2012, NIH R&D funding increased 132 percent from just over \$13 billion to nearly \$31 billion. NSF funding also more than doubled from \$2.8 to \$5.9 billion. By comparison, the USDA's increase over that time period appears miniscule at just 21 percent, from \$2 billion to \$2.4 billion. While I'm not advocating that we take any money away from NIH or NSF, it's astounding to see that the USDA's R&D budget amounts to less than 10 percent of NIH's.

My point is – the request to double federal USDA investments over the next decade isn't extreme; it amounts to a drop in the federal bucket when compared to NIH investments.

Last year's Farm Bill did help move us a little further in the right direction through the creation of

the Foundation for Food and Agricultural Research (FFAR). Congress provided \$200 million – which must be matched by non-federal funds – with the goal of leveraging both public and private resources to advance our ag economy.

It's a start; we still have a long ways to go, but we can get there if we commit to a common message. And that message is this: we need an expanded set of resources, not a reallocation of the current resources.

We need a “bigger funding pie” that can adequately feed us, protect our environment, strengthen our economy, keep us healthy, and keep us safe for generations to come. We need to emphasize that without additional resources, the consequences of lagging agricultural innovation and production will be felt – not only in the villages of Uganda and Somalia – but right here at home.

The humanitarian and economic impacts of food and water scarcity won't be a “third-world problem,” they will be a worldwide problem – and even a main street U.S.A. problem. We need to make it clear that this must be a national priority.

### **Think bigger, act bolder**

We must not be afraid to think bigger and act bolder. Innovation, boldness, and partnerships empowered the land-grant revolution, which in turn revolutionized the agriculture industry. Now, it's our turn – public universities, private universities, the USDA-ARS and their many partners – to come together to launch a renewed and heightened effort to ensure a safe, healthy, and sustainable future.

Agriculture, food, and natural resources need to be at the forefront of science. As the *Pursuing a Unifying Message* report articulates so well – “connect the dots of every major societal challenge ahead and the picture that emerges is the critical importance of agricultural research.”

Thank you.

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To view Dr. Leath's full presentation, go to [www.aaas.org/riley-lecture](http://www.aaas.org/riley-lecture).

To read report the June 2015 report “*Pursuing a Unifying Message: Elevating Food, Agricultural and Natural Resources Research as a National Priority. A University Perspective*,” go to [www.rileymemorial.org](http://www.rileymemorial.org).

# Panel Discussion Highlights

President Leath's address was followed by a rousing discussion with a panel of distinguished stakeholders. Below are highlights from their exchange.

**Moderator Catherine Bertini began the conversation with:**

“Following on President Leath's discussion on issues relating to research being important in issues relating to health, it seems to me if we were able to better connect the dollars involved in health and the money the federal government spends on health to the research needs [in agriculture] that might avoid some of that expenditure then we might be better off...”

**Catherine Woteki commented:**

“At USDA, we are frequently asked about outcomes. It's not just the investment, not just the publications and the patents, it's what difference are you making? And both through the land-grant universities as well as what we've been doing at USDA, we are collecting those stories; we are providing them to the public through a variety of different means. We are using them when we go to meet with Members of Congress to provide that evidence of specific outcomes.... And it's not just in health.”

“These stories are very useful in pointing out that just because you're making the investment today, it doesn't mean you're going to have an immediate return next year; it might actually be a return that comes to full fruition over decades.”

**Steven Leath furthered this point:**

“If we can develop better messages [on the ag research side]— especially with policy makers—the more direct linkage we can show of pay off, economically or quality-wise, the better off we are going to be.”

**Bertini continued to Don Villwock:**

“How do you convince senators and representatives from Indiana about the needs of first, Indiana farmers, and second, the connections between your needs and the general public health needs?”

**He responded:**

“You have a vested interest when you walk on Capitol Hill and politicians are somewhat expecting you to say ‘we're underfunded and research is very expensive and we're all competing for this talent’ ... It's expected and that's what you do... As we talk about forming partnerships of how to spread this message I really think you need to involve us the stakeholders as the ultimate beneficiaries. Really, the ultimate beneficiary is the consumer, but I am the final stop before you get to someone's stomach, being the farmer.”

# Panel Discussion Highlights

(continued)

**Woteki went on to add:**

“There is growing public awareness of the impending challenges outlined by President Leath. Part of the challenge on this unifying message theme is going beyond what the traditional agricultural research universities and the broader interested parties in production agriculture bring... But rather, how do we talk to those who are not in the agricultural community, who are not on the appropriations committees to bring their awareness that the investment here in agricultural research is actually freeing ‘you’ up to do what you do because a farmer is producing and producing well... We have access to a very low cost food supply, a very plentiful food supply, and that allows us to be lawyers and doctors and university professors... So getting that message across is an important part of the process. We have to talk beyond our traditional constituencies...”

**Before opening the discussion to the audience, Bertini asked:**

“If we are to have a unified message, what does the message include about the difference between research on crops grown in North America and research on indigenous crops and others grown in the developing world? And how do we distinguish the need for the latter in our domestic institutions?”

**Leath offered:**

“Much of the science will be the same. If you look at California and you look at Sub-Saharan Africa, there are issues with disease, issues with insects, but most importantly there is an interest right now in developing crops that use less water. So as we develop these technologies and use tax money primarily for the U.S., many of those technologies are going to expand... But the bigger, broader question is: what is our humanitarian obligation? If we have the capacity, the resources, and the knowledge to save lives and greatly improve quality of life... If we set our national priorities, many of those will have benefits around the world...”

**Villwock added:**

“Research is research, wherever it is and it’s pretty fundamental...”

**Woteki concluded with:**

“Agriculture has benefited enormously and capitalized on the biological revolution and that is global. And also, we are really at the cusp of having a major leadership role in agriculture science through open data and those applications globally... The implementation that is going forward from the President’s science advisor to provide open access to scholarly publications and the underlying data that are a result of federal investment is going to be widely accessible... The investment being made in the U.S. in our agricultural science is already having benefits globally.”



# Participant Bios



**Steven Leath** became Iowa State University's 15th President in January 2012. He leads a university that educates more than 34,000 students, employs 6,300 faculty and staff, and belongs to the Association of American Universities (AAU). Dr. Leath is leading Iowa State in strategic initiatives to: maintain and improve the high quality student educational experience for which the university is known; strengthen the university's scholarly reputation; broaden its research enterprise; expand its economic development programs and activities for the state of Iowa; and increase diversity among students, faculty, and staff. Under his leadership, the university has enrolled record numbers of students, dramatically increased full-time faculty hiring, surpassed its private fund-raising goals, and maintained the lowest tuition and fees of its peer group of 11 universities. Iowa State has been nationally recognized as one of the most efficiently run universities in the country as well as having one of the most beautiful campuses. Dr. Leath trained as a plant scientist, and prior to becoming President, he served at three universities in teaching, research and economic development. He received his B.S. from Pennsylvania State University, M.S. in plant science from the University of Delaware, Newark; and Ph.D. in plant pathology from the University of Illinois, Urbana.



**Catherine Bertini** is Professor of Public Administration and International Affairs at the Maxwell School of Citizenship and Public Affairs at Syracuse University. Her career spans public service at international, national, state, and local levels and includes university teaching and leadership roles in private and non-profit sectors. Currently she is a Distinguished Fellow of the Chicago Council of Global Affairs, where she served for five years as co-chair of its Global Agricultural Development Initiative (GADI) and chair of its Girls in Rural Economies Project. The GADI Project is credited with creating the intellectual argument to increase priority of support for poor farmers in the developing world. For two years, she was Senior Fellow, Agricultural Development at the Bill & Melinda Gates Foundation. Ms. Bertini was the driving force behind reform of the United Nations World Food Programme (WFP), where she was the Chief Executive for ten years. She was first appointed as the Executive Director of WFP in 1992 upon recommendation of President George H.W. Bush and was re-appointed with the support of the administration of President Bill Clinton. Ms. Bertini was named the 2003 World Food Prize Laureate for her leadership in "transforming WFP in to the largest and most responsive humanitarian organization in the world." With her World Food Prize, she created the Catherine Bertini Trust Fund for Girls Education at WFP/USA. It supports programs to increase the numbers and longevity of girls in school.

## Participant Bios (continued)



**Don Villwock** is President of the Indiana Farm Bureau. His farming operation produces white corn, soybeans, seed soybeans, and seed wheat. Prior to his election to president in 2002, he served as vice president, District 7 director, Knox County president, State Young Farmer Committee chairman, and Feed Grains Committee chairman. He also serves as president of Indiana Farm Bureau Insurance Companies. At the national level, Mr. Villwock is a member of the American Farm Bureau board of directors and its Executive committee. He is the National Vice President of the Farm Bureau Bank, American Agricultural Insurance Company, and AFBIS. Mr. Villwock has been involved with the Indiana Corn Growers, Indiana Soybean Growers, and the Indiana Pork Producers. He has also served as chairman of the Indiana Institute of Agriculture. A graduate of Purdue University with a degree in agricultural economics, Mr. Villwock was appointed by President Bush to serve as state executive director of the Agricultural Stabilization and Conservation Service from 1989 to 1993. He also served as state agricultural liaison for U.S. Senator Richard Lugar. Mr. Villwock was appointed to the national Commission on 21st Century Production Agriculture in 1997.



**Catherine Woteki** is Under Secretary for the USDA's Research, Education, and Economics (REE) mission area, as well as the Department's Chief Scientist. Her responsibilities include oversight of the four agencies that comprise REE – Agricultural Research Service, National Institute of Food and Agriculture, Economic Research Service, and National Agriculture Statistics Service. Since returning to USDA, Dr. Woteki has followed the direction established by Congress, developing the Office of the Chief Scientist, the USDA Science Council, and other coordinating programs. She has been called upon to lead scientific delegations to China and the first Meeting of Agricultural Chief Scientists held under the auspices of the G-20 leader, Mexico. Before joining USDA, Dr. Woteki served as Global Director of Scientific Affairs for Mars, Incorporated, where she managed the company's scientific policy and research on matters of health, nutrition, and food safety. Prior to this role, she was the Dean of the College of Agriculture and Life Sciences at Iowa State University, and she was the first Under Secretary for Food Safety at USDA from 1997 to 2001.

# Federal Food, Nutrition, Agriculture and Natural Resource Sciences Funding Update

## **Matt Hourihan**

Director, R&D Budget and Policy Program  
American Association for the Advancement of Science

**W**ith Republicans in control of both chambers and a single Congressional budget resolution for the first time in six years, there is unsurprisingly little daylight between USDA appropriations levels in the two chambers. The Administration budget for FY 2016 had sought to boost funding for facilities construction and modernization on the intramural front, and a significant increase for peer-reviewed competitive extramural research via the Agriculture and Food Research Initiative (AFRI); the Administration also repeated last year's request for public-private innovation institutes. But appropriators in neither chamber have embraced these proposals. Instead, most major USDA R&D accounts received flat or trimmed funding so far.

It's a similar story for the National Science Foundation and the Department of Energy's Office of Science, where requests for increased funding have been turned away by appropriators. The exception to this general trend is the National Institutes of Health. The Administration had asked for a \$1 billion funding increase for NIH; House appropriators granted a \$1.1 billion increase, and Senate appropriators a \$2.0 billion increase, which would be the largest in over a decade for NIH. But many of these numbers may be subject to revision, as a budget deal to partially increase discretionary spending – which remains at post-sequestration levels under current law – may yet be in the cards.

This table and analysis present updated figures from the chapter on “Agriculture and Natural Resources” in the *AAAS Report XL: Research and Development FY 2016*. Figures have been updated based on additional agency reporting and appropriations bills and reports from Congress. To read the entire analysis, go to [www.aaas.org/fy16budget/toc](http://www.aaas.org/fy16budget/toc).

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# Federal Food, Nutrition, Agriculture, and Natural Resource Science Investments

(budget authority in millions of dollars)

|   | FY 2014<br>Actual | FY 2015<br>Estimate | Change FY 14-15 |             | FY 2016<br>Budget | FY 2016<br>House** | Change FY 15-16 |              | FY 2016<br>Senate | Change FY 15-16 |              |
|---|-------------------|---------------------|-----------------|-------------|-------------------|--------------------|-----------------|--------------|-------------------|-----------------|--------------|
|   |                   |                     | Amount          | Percent     |                   |                    | Amount          | Percent      |                   | Amount          | Percent      |
| <b>Selected USDA Program R&amp;D</b>        |                   |                     |                 |             |                   |                    |                 |              |                   |                 |              |
| Agricultural Research Service (ARS)         | 1,148             | 1,203               | 55              | 4.8%        | 1,424             | 1,194              | -9              | -0.8%        | 1,163             | -40             | -3.3%        |
| Natl Inst of Food & Agri (NIFA)*            | 800               | 807                 | 7               | 0.9%        | 1,025             | 804                | -3              | -0.4%        | 810               | 3               | 0.3%         |
| Agri & Food Research Init (AFRI)            | 316               | 325                 | 9               | 2.8%        | 450               | 335                | 10              | 3.1%         | 325               | 0               | 0.0%         |
| Forest Service**                            | 300               | 301                 | 1               | 0.3%        | 297               | 284                | -17             | -5.7%        | 297               | -4              | -1.3%        |
| Forest and Rangeland Research               | 293               | 296                 | 3               | 1.1%        | 292               | 278                | -18             | -6.2%        | 292               | -4              | -1.4%        |
| <b>U.S. Dept of Agriculture R&amp;D</b>     | <b>2,380</b>      | <b>2,446</b>        | <b>66</b>       | <b>2.8%</b> | <b>2,884</b>      | <b>2,411</b>       | <b>-35</b>      | <b>-1.4%</b> | <b>2,408</b>      | <b>-38</b>      | <b>-1.6%</b> |
| <b>Other Related Agency R&amp;D Budgets</b> |                   |                     |                 |             |                   |                    |                 |              |                   |                 |              |
| National Institutes of Health***            | 29,251            | 29,488              | 237             | 0.8%        | 30,476            | 30,556             | 1,068           | 3.6%         | 31,434            | 1,946           | 6.6%         |
| National Science Foundation                 | 5,800             | 5,999               | 198             | 3.4%        | 6,309             | 6,077              | 78              | 1.3%         | 6,031             | 33              | 0.5%         |
| Dept of Energy - Office of Science          | 4,724             | 4,680               | -44             | -0.9%       | 4,900             | 4,680              | 0               | 0.0%         | 4,720             | 40              | 0.9%         |

Source: AAAS estimates based on OMB R&D data, agency budget documents, and Congressional reports. All spending bills affecting the above agencies have been approved by appropriations committees in both chambers, but none have passed the full Senate, and only NSF and DOE appropriations have been adopted by the full House.

\* Includes \$3 million annually for Biomass R&D program.

\*\* Excludes \$238 million in emergency Ebola-related funding in FY 2015.

# About Charles Valentine Riley

## Charles Valentine Riley (1843-1895)

“Professor Riley,” as he was generally known, was born in Chelsea, London, England, on September 19, 1843. He attended boarding school at Dieppe, France; and Bonn, Germany. Passionately fond of natural history, drawing, and painting, he collected and studied insects and sketched them in pencil and in color. At both Dieppe and Bonn, he won prizes in drawing and was encouraged to pursue art as a career.

At the age of 17, he came to the United States and settled on an Illinois farm about 50 miles from Chicago. Soon his attention was drawn to insect injuries of crops, and he sent accounts of his observations to the *Prairie Farmer*. At the age of 21, Riley moved to Chicago and worked for this leading agricultural journal as a reporter, artist, and editor of its entomological department. His writings attracted the attention of Benjamin D. Walsh, the Illinois State entomologist. It was through Walsh's influence as well as the recommendation of N. J. Coleman of *Coleman's Rural World* that Riley was appointed in the spring of 1868 to the newly created office of entomology of the State of Missouri. From 1868 to 1877, in collaboration with T. W. Harris, B. D. Walsh, and Asa Fitch, Riley published nine annual reports as State Entomologist of Missouri, which unequivocally established his reputation as an

eminent entomologist. Today, authorities agree that these nine reports constitute the foundation of modern entomology.

From 1873 to 1877, many Western States and territories were invaded by grasshoppers from the Northwest. In some states their destruction of crops was so serious that it caused starvation among pioneer families. Riley studied this plague and published results in his last three Missouri annual reports and worked to bring it to the attention of Congress. In March 1877, he succeeded in securing passage of a bill creating the United States Entomological Commission, the Grasshopper Commission administered under the Director of the Geological Survey of the U. S. Department of the Interior. Riley was appointed chairman, A. S. Packard, Jr., secretary, and Cyrus Thomas, treasurer.

All this time, Riley, with the help of Otto Luggler, Theodore Pergrande, and others, was also making brilliant contributions to the knowledge of the biology of insects. Besides studying the life cycles of the 13 and 17 year cicadas, he also studied the remarkable *Yucca* moth and its pollination of the *Yucca* flower, a matter of special evolutionary interest to Charles Darwin. In addition, he conducted intensive life history studies of blister beetles and their unusual triungulin larvae, and the caprifigation of the fig.

In the spring of 1878, Townend Glover retired as



Charles Valentine Riley Examining an Insect.



# About Charles Valentine Riley

(continued)

entomologist to the U. S. Department of Agriculture and Riley was appointed his successor. After a year in this position, Riley resigned owing to a disagreement with the Commissioner of Agriculture over Riley's practice of making independent political contacts; he then continued the work of the U. S. Entomological Commission with others, from his home. Two years later, after the inauguration of President James A. Garfield in 1881, Riley was reappointed and remained chief of the Federal Entomological Service until June 1894, when the Service was renamed the Division of Entomology of the U.S. Department of Agriculture. In 1882, Riley gave part of his insect collection to the U. S. National Museum, now The Smithsonian Institution, at which time he was made honorary curator of insects. In 1885, he was appointed assistant curator of the Museum, thus becoming the Museum's first curator of insects, whereupon he gave the Museum his entire insect collection consisting of 115,000 mounted specimens (representing 20,000 species), 2,800 vials, and 3,000 slides of specimens mounted in Canadian balsam.

One of Riley's greatest triumphs while Chief of the Federal Entomological Service was his initiation of efforts to collect parasites and predators of the cottony cushion scale, which was destroying the citrus industry in California. In 1888, he sent Albert Koebele to Australia to collect natural enemies of the scale. A beetle, *Vedalia cardinalis*, now *Rodolia cardinalis*, was introduced into California and significantly reduced populations of the cottony cushion scale. This effort gave great impetus to the study of biological control for the reduction of injurious pests and established Charles Valentine Riley as the "Father of the Biological Control." For a review of the cottony cushion scale project, see Douth, 1958.

A prolific writer and artist, Riley authored over 2,400 publications. He also published two journals, the *American Entomologist* (1868-80) and *Insect Life* (1889-94). Riley received many honors during his lifetime. He was decorated by the French Government for his work on the grapevine *Phylloxera*. He received honorary degrees from Kansas State University and the University of Missouri. He was an honorary member of the Entomological Society of London and founder and first president of the Entomological Society of Washington. He and Dr. L. O. Howard, Riley's assistant in the Federal Entomological Service, were among the founders of the American Association of Economic Entomologists, which became part of Entomological Society of America in 1953.

Tragically, on September 14, 1895 Riley's life was cut short by a fatal bicycle accident. As he was riding rapidly down a hill, the bicycle wheel struck a granite paving block dropped by a wagon. He catapulted to the pavement and fractured his skull. He was carried home on a wagon and never regained consciousness. He died at his home the same day at the age of 52, leaving his wife and six children.

## ACKNOWLEDGEMENTS

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# About the Partner Organizations

In 2008, the Charles Valentine Riley Memorial Foundation (RMF) selected the American Association for the Advancement of Science (AAAS) to receive an endowment to establish an annual lecture “to promote a broader and more complete understanding of agriculture as the most basic human endeavor and ... to enhance agriculture through increased scientific knowledge.”

Concurrently with establishment of the endowment, a collaborative agreement between RMF, AAAS, and the World Food Prize Foundation (WFPF) was signed to implement the annual lecture. Collaboration between AAAS, RMF, and WFPF provides a unique opportunity to build upon Charles Valentine Riley’s legacy as a “whole picture” person with a vision for enhancing agriculture through scientific knowledge. Professor Riley’s involvement with AAAS, beginning as a member in 1868, being elected a Fellow in 1874, and serving as Vice President for the biology section in 1888, brings into the perspective his broad view of how science impacts on agriculture when placed in the broadest context.



## The American Association for the Advancement of Science (AAAS)

The American Association for the Advancement of Science (AAAS) is the world’s largest general scientific society and publisher of the journals *Science* ([www.sciencemag.org](http://www.sciencemag.org)), *Science Signaling* ([www.sciencesignaling.org](http://www.sciencesignaling.org)), *Science Translational Medicine* ([www.sciencetranslationalmedicine.org](http://www.sciencetranslationalmedicine.org)), and a digital, open-access journal, *Science Advances* ([www.scienceadvances.org](http://www.scienceadvances.org)). AAAS was founded in 1848, and serves 262 affiliated societies and academies of science, reaching 10 million individuals. The non-profit is open to all and fulfills its mission to “advance science and serve society” through initiatives in science policy, international programs, science education, and more. More information on AAAS and its diverse portfolio of activities can be found at [www.aaas.org](http://www.aaas.org).



## Charles Valentine Riley Memorial Foundation

The Charles Valentine Riley

Memorial Foundation (RMF) is committed to promoting a broader and more complete understanding of agriculture and to build upon Charles Valentine Riley’s legacy as a “whole picture” person with a vision for enhancing agriculture through scientific knowledge. RMF, founded in 1985, recognizes that agriculture is the most basic human endeavor and that a vibrant, robust, food, agricultural, forestry, and environmental-resource system is essential for human progress and world peace. RMF conducts a wide range of program activities that include discussion groups, forums, round tables, workshops, briefing papers, and lectures on various parts of the food, agricultural, forestry, and environmental-resource system. RMF’s goal is to have all world citizens involved in creating a sustainable food and agriculture enterprise within a responsible rural landscape. More information is available at <http://www.rileymemorial.org>.

# About the Partner Organizations

(continued)

## World Food Prize Foundation



Founded by Nobel laureate and “Father of the Green Revolution” Dr. Norman E. Borlaug, the World Food Prize is a \$250,000 award presented annually for breakthrough achievements in science, technology, and policy that have improved the quality, quantity, and availability of food in the world. Termed “the Nobel Prize for Food and Agriculture” by several heads of state, it is presented

each October in conjunction with a week of events that includes the international “Borlaug Dialogue” symposium and gathers pre-eminent global leaders and experts representing over 65 countries. The 2015 World Food Prize events will take place October 14-16 in Des Moines. Information about the World Food Prize events, highlights from past Borlaug Dialogue symposia, and nomination criteria are available at [www.worldfoodprize.org](http://www.worldfoodprize.org).

Cover photo: Close-up of green agricultural fields, Western Cape, South Africa. HENK BADENHORST/Getty Images  
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