S. HRG. 110–42

INVESTING IN OUR NATION'S FUTURE THROUGH AGRICULTURAL RESEARCH

HEARING

BEFORE THE

COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY UNITED STATES SENATE

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

MARCH 7, 2007

Printed for the use of the
Committee on Agriculture, Nutrition, and Forestry

Available via the World Wide Web: http://www.agriculture.senate.gov

U.S. GOVERNMENT PRINTING OFFICE

35–042 PDF WASHINGTON : 2007

For sale by the Superintendent of Documents, U.S. Government Printing Office
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INVESTING IN OUR NATION'S FUTURE THROUGH AGRICULTURAL RESEARCH

Wednesday, March 7, 2007

U.S. SENATE,
COMMITTEE ON AGRICULTURE,
NUTRITION, AND FORESTRY
Washington, DC

The Committee met, pursuant to notice, at 9:32 a.m., in room SR–328A, Russell Senate Office Building, Hon. Tom Harkin, Chairman of the Committee, presiding.

Present: Senators Harkin, Stabenow, Salazar, Casey, Chambliss, and Thune.

Also present: Senator Bond.

STATEMENT OF HON. TOM HARKIN, A U.S. SENATOR FROM IOWA, CHAIRMAN, COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY

Chairman HARKIN. The Senate Committee on Agriculture, Nutrition, and Forestry will come to order.

By the way, I was just notified that the votes we were supposed to have were moved to this afternoon, so it looks like we will be OK for our hearing this morning. We had three votes scheduled at 10 o'clock, and I think they have been moved.

Today's hearing will examine an often overlooked yet vital portion of the farm bill, and that is the research title. This provides a wide range of benefits to our society, from agricultural producers to consumers. Every kind of research related to food and agriculture is supported by the farm bill, from nutrition to food safety to energy, plant and animal diseases. So much of what we seek in our Nation's future depends on the quality and quantity of our ag research, extension, and education programs.

I believe we take agricultural research for granted because many of us here in the United States take our food supply kind of for granted. Every fruit, vegetable, and cut of meat the public eats has a research story behind it, whether it is a story about improving its nutrition, safety, flavor, or production. The products of agricultural research are literally consumed by Americans every day of their lives, and I hope to ensure with this year's farm bill that every ounce of renewable energy that someday every American will use will have a research story behind it, too. And I will be asking a lot of questions about research and energy in our hearing this morning.

Ag research has already produced countless success stories. We continue looking to it to guide our food production, our eating hab-

its, and now, again, our energy production. Because of agricultural research, we know that particular foods contain anti-cancer compounds. We have developed crop varieties that are resistant to particular diseases. And we know that conservation is important to keeping farmland productive.

The list could go on and on. The successes are many. But I think it is safe to say the fact that we have the most abundant supply of food, the biggest variety of food, and the cheapest food available to our consumers of anywhere in the world really tells the story of agricultural research.

But America's investment in ag research, extension, and education has fallen behind. That fact is clear when we compare agricultural research funding with other non-defense research and development funding.

For example, I sit on another Committee that has authorization over the NIH, and the National Institutes of Health experienced a doubling of their funding in a 5–year period, from 1998 to 2002, a very strong bipartisan effort with the White House to get that done, encompassing two administrations.

In comparison, funding for the U.S. Department of Agriculture's research, education, and extension programs has remained almost flat in inflation-adjusted dollars over the past two decades.

Now, biomedical research, of course, is important and saves lives every day. No doubt about it. But agricultural research does the same, and when its vast potential is unleashed, the effects are profound. Again, we only need to look at the work of Dr. Norman Borlaug to see the millions of lives saved by agricultural research.

So I look forward to our witnesses today in the hearing and the questions and answers that we will have, and now I will turn to our distinguished Ranking Member, Senator Chambliss.

STATEMENT OF HON. SAXBY CHAMBLISS, A U.S. SENATOR FROM GEORGIA

Senator CHAMBLISS. Well, thank you very much, Chairman Harkin, and as always, I appreciate your holding a hearing on such a critically important matter to agriculture and the various proposals being presented today and look forward to our discussion on them.

The U.S. investment in agricultural research, extension, and education programs has been one of the primary reasons for the great productivity of our farmers and ranchers over the past century. This investment also has helped farmers protect and enhance the natural resource base of this country. It is hard to imagine how we would have survived and reversed the damage caused by the Dust Bowl years without research, extension, and conservation programs. We need to continue to invest in our research institutions and programs to ensure U.S. farmers and ranchers can meet the growing demand for food, fuel, and fiber, while also protecting the environment.

Some believe we are at a crossroads for U.S. agricultural research systems. Stakeholders are asking if the current structure and funding mechanisms will work as well for us in the future as they have in the past. I thank the individuals and organizations that have made recommendations. Their proposals cover a wide range of policy options. I understand the time and effort it takes

to develop a serious proposal and realize that by suggesting something new, criticism can follow. I appreciate that this discussion is taking place and encourage all stakeholders to engage in this issue and work with this Committee to ensure our agricultural research system can meet the challenges of the 21st century.

And let me say, Mr. Chairman, our first witness today is a longtime dear personal friend of mine, a guy who spent part of his academic career in Iowa, and he wandered out there but found his way back to Georgia.

Dr. Gale Buchanan was Dean of the College of Agricultural Sciences and Environmental Works at the University of Georgia for many years, and in that capacity, boy, what a fan of research he has been and a guy who just devoted a lot of time and effort to ensuring that funds flowed not just to the University of Georgia, where we have an outstanding Department of Research, but that the funding our land grant colleges around the country was made available at least at the level that we are seeing it. So I am very pleased that he is here this morning to share some thoughts with us. In his new position now, he is officially the Under Secretary for Research, Education, and Economics, but he is a great American and a great friend. He actually lives down in my part of the world. He has a farm over in Cook County, Georgia, which adjoins my home county.

So I am very pleased that Gale is here to share some thoughts and ideas with us this morning.

Chairman HARKIN. Thank you very much, Senator Chambliss.

Now, for the purpose of a statement but also I know Senator Bond has a schedule he has to make this morning, and also for the purposes of an introduction of someone who is going to be on the second panel, Senator Bond.

STATEMENT OF HON. CHRISTOPHER S. BOND, A U.S. SENATOR FROM MISSOURI

Senator BOND. Well, thank you very much, Chairman Harkin and Senator Chambliss. Thank you for holding this critically important hearing on agricultural research and for giving me this opportunity to introduce a dear friend, a distinguished scientist, Dr. William Danforth. I will submit his very lengthy and distinguished resume for the record, but I think all of the people from the academic and science communities who are here with us and, I trust, members of this Committee and staff know about his great record.

I apologize because if I were controlling my schedule, I would be here for the entire hearing because it is that important. Unfortunately, my very attentive staff has scheduled me back to back for the rest of the morning, and I will not be able to do it. I will submit Dr. Danforth's resume, but one of his most recent contributions to the science community was his service as Chairman of the Research, Education, and Economics Task Force, which was authorized in the 2002 farm bill. And I might say, Mr. Chairman, on all these things we worked over the years in this Committee and in the Appropriations Committee to push this vital subject of ag research, which you so eloquently described.

The Secretary of Agriculture appointed five other members from different land grant institutions, the President of the BBI and a

representative from Watershed Agricultural Council, to review and evaluate the merits of establishing one or more national institutes focused on disciplines important to food and agricultural sciences and then report the findings to Congress and the USDA.

The task force report to Congress entitled "The National Institute for Food and Agriculture," or NIFA, as I understand it is appropriately pronounced, highlights the challenges, opportunities, models, recommendations, and the need for action. The challenges, quite simply, are that American agriculture faces serious challenges, including increasing foreign competition, diseases of plants and animals, calls for greater food safety, demands for better diets that promote health and avoid obesity, the need to protect and enhance the environment, demands for renewable sources of energy and new sources of domestic energy and biodegradable products, and not the least, world hunger. This provides tremendous opportunities for America's agricultural community. Advances in the life sciences and genetics, proteomics, cell and molecular biology provide the base for new and continuing agricultural innovations.

Fortunately, the National Institutes of Health and the National Science Foundation have long and successful experience in fostering that research, which has led to spectacular innovations in health and other fields. Especially effective have been programs that allow scientists to compete for grants and fund proposals on the basis of scientific merit and national need. These lessons have not been applied to the field of agriculture.

On a personal note, I worked with you when I had the privilege of chairing the subcommittee that funds the National Science Foundation, and while you and Senator Specter were able to double the funding for NIH, we have not been able to get NSF funding any substantial increase. I have been blasted by the President's Science Adviser, and I pointed out to him that OMB has not put any money in, and we did not have the money to increase the NSF budget. But about 10 years ago, I did a wild and foolish thing, which gained me a lot of scorn and obloquy from the scientific community by directing that the NSF expand its genetic engineering research and begin mapping the plant genome of commercial commodities, beginning with maize. Fortunately, Dr. Mary Clutter, a cell biologist, took that program and made it into a major program in NSF. So we sneaked one into the NSF budget, and the results have been spectacular and I think show what can be done for agriculture if we can adopt the kind of program that is laid out in NIFA.

The task force that was chaired by Dr. Danforth recommended a National Institute for Food and Agriculture. To be successful in promoting modern life sciences research, NIFA will have to develop its own culture and its own relations with Congress that are similar to those of NIH and NSF. NIFA should not replace the traditional research programs of the USDA that remain valuable for many reasons, including the practical challenges of making sure that advances from fundamental research are adapted to local and regional needs and that we can have applied research and development. And I say that to keep my friends from land grant colleges and agricultural institutions off my back. It is not to replace—you gentlemen have heard me all right. The proposed program would grow in cost hopefully over a 5–year period, eventually reaching an

annual expenditure of $1 billion, which, frankly, is not much given the potential in this field.

The National Academy of Science and others have somewhat similar recommendations. For over three decades, the interim challenges to American agriculture have become more acute and the scientific opportunities have grown. The task force concluded that funding for fundamental research is woefully inadequate. Other nations are making investments in agricultural science with a goal of competing more effectively in the world markets. The time for complacency is over. The task force members have faith that America's response will be appropriate, and I hope that with your leadership, Mr. Chairman and Senator Chambliss, we can make Congress take the necessary steps.

Personally, I think Dr. Danforth and the members of the task force for their commitment to science, and particularly to the future of agricultural research. And I look forward to working very closely with you, Mr. Chairman and Ranking Member, to introduce the NIFA bill in the 110th Congress.

Chairman HARKIN. Thank you very much, Senator Bond, and I understand that you have other things you have to do.

Senator BOND. Unfortunately, I do.

Chairman HARKIN. Senator Salazar, did you have a brief opening statement that you would like to make?

STATEMENT OF HON. KEN SALAZAR, A U.S. SENATOR FROM COLORADO

Senator SALAZAR. I have a statement that I will submit for the record, Mr. Chairman, and let me also just say to you, Mr. Chairman, that I very much appreciate your willingness to come out to Colorado and to hold a hearing on the farm bill. The people are Colorado are excited to have you there. We will be doing beyond just a farm hearing, also looking at the National Renewable Energy Lab for about 3 hours, and I know that is such an important part of the bipartisan effort here that we will see on biofuels in Title IX in the farm bill.

So we are excited to have you there, and we look forward to working with you on all the issues of the farm bill, including the issue of research, which is so much at the foundation of the future of Colorado.

Thank you very much.

Chairman HARKIN. How much snow will we have before we get there?

[Laughter.]

Chairman HARKIN. It seems like every time I look at the weather map, you are getting more snow in Colorado. Of course, the ski country has been great, I guess, right?

Senator SALAZAR. Well, we have had up to 4 feet, but most of it is gone. So I think the skies will be blue, and it will be a welcoming time for you there.

Chairman HARKIN. Very good.

Well, we welcome Dr. Gale Buchanan, Under Secretary for Research, Education, and Economics at USDA. Again, as my good friend Saxby Chambliss said, Dr. Buchanan earned most of his degrees in Florida, and then came to Iowa State, and got his Ph.D.

at Iowa State. We are very proud of you, proud of your involvement with Iowa and just proud of your whole career, Dr. Buchanan.

Your statement will be made a part of the record in its entirety, and if I could ask you to sum it up, I think we would much rather get into kind of a colloquy with you on some of these issues. But, welcome, Dr. Buchanan, and please proceed. If you can sum it up in 5 minutes or so, I would sure appreciate it. Then we will just have—like I say, we will just talk to each other.

STATEMENT OF GALE BUCHANAN, UNDER SECRETARY, RESEARCH, EDUCATION, AND ECONOMICS, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, DC

Mr. BUCHANAN. Thank you very much. Chairman Harkin and Ranking Member Chambliss and other distinguished members of the Committee, this is the first time I have been back before the Committee since my confirmation this past May, and it is a real pleasure to be here this morning to talk about the Department of Agriculture's research, education, and economics area, and particularly about Title VII of the 2007 farm bill proposals that were recently released.

In my 40–plus years in agricultural research and administration, I have never seen such exciting times in agriculture, and that is a very important statement. We are in the early stages of a major change in agriculture. I do not think it is anything like we have seen in 150 years. We have gone from the mission of producing food, feed, and fiber to a responsibility and a mission for producing food, feed, fiber, and fuel, or energy, and that is a major undertaking.

Along with this great challenge and exceedingly high expectations are unparalleled needs for research, education, and extension programs to support this effort. Science has served us as a vitally important foundation for our Nation's agricultural system. This systems provides this Nation and much of the world with the need for the necessities of life.

While there has been excellent success in the past, I think we must build an even stronger foundation to maintain our leadership in agriculture for the future. This is imperative if this Nation's agricultural system is to continue to be a world leader and not be severely crippled by the ever increasing problems that we have in agriculture, from pest threats, changing world markets, droughts, and other natural impacts that always seem to affect agriculture.

The administration's Title VII of the 2007 farm bill proposals provide the organizational structure and specific funding of particular high-priority initiatives for meeting the immediate and long-term scientific needs of agriculture.

While the organizational structure of our programs has served us well in the past, we have a responsibility to strive continuously to improve their efficiency and effectiveness. However, I think we must make some changes to ensure our success in the future.

Looking to the future, the administration proposes the creation of the Research, Education, and Extension Service, REES. This would be through the merger of the Agricultural Research Service, ARS, and the Cooperative State Research, Education, and Extension Service. This new agency would be under the leadership of a

chief scientist who would have overall responsibility for both intramural and extramural research efforts within the Department. All current formula funding authorities, including those for Hatch, Smith-Lever, McIntire-Stennis, 1890, 1994, Hispanic Serving Institutions would remain in effect. Duplication of effort between intramural and extramural programs would be minimized while better identifying and utilizing comparative strengths of USDA's in-house capacity as well as USDA's university partners and other cooperators in this great effort. Having a single national program staff would greatly facilitate stakeholder interaction.

Another part of the 2007 farm bill proposals is the call for $50 million in annual mandatory spending for the creation of the Agricultural Bioenergy and Bio-based Products Research Initiative to enhance the production and conversion of biomass to renewable fuels and bio-products. This new addition would focus research and development efforts on two primary objectives: the first is producing biomass in a sustainable way; and, second, to convert that into biofuels or other useful bio-products.

Since the sun is our most reliable source of energy, and agriculture is in the business of converting the sun's energy into things useful to man, it is absolutely clear to me that agriculture will play a vital role in this Nation achieving a greater degree of energy independence for the future.

Another part of the administration's proposal is a recommendation for the establishment of a Specialty Crops Research Initiative supported by $100 million of annual mandatory funding. During the farm bill listening sessions, we repeatedly heard the call for an increased investment in research for specialty crops. Specialty crops comprise a substantial part of the total crop portfolio of American agriculture, and they also play a critical role in providing a balanced nutritional diet for all Americans. Some of the specific issues to be addressed would include but not be limited to genetics, genomics, bringing new varieties, food safety, quality, production, efficiency, mechanization, et cetera.

Mr. Chairman, again, thank you for the opportunity to testify before the Committee regarding USDA's farm bill proposals to strengthen the Nation's agricultural research, extension, and education programs. I look forward to hearing your comments and responding to your questions. Thank you very much.

[The prepared statement of Mr. Buchanan can be found on page 58 in the appendix.]

Chairman HARKIN. Thank you very much, Dr. Buchanan, and I will just start off here and take 5 or 6 minutes, and then we will go around. I think we will probably have a couple of rounds.

First of all, Dr. Buchanan, one of the things about having been here as long as some of us have been, we remember things. In 1977, I was on the House Ag Committee. In fact, I was on the subcommittee that dealt with research on the House side. And the then-Secretary of Agriculture, Bob Bergland, from Minnesota, Secretary Bergland, in response to, I think, some congressional input, did a similar thing. They created the Science and Education Administration in 1977. It consolidated ARS, the Cooperative State Research, Education, and Extension Service. About 4 years later, the Science and Education Administration was dissolved because it

created another level of bureaucracy for stakeholders, and that is what we heard. Again, I was still in the House at the time. We heard from our land grant colleges, we heard from others, who said the Science and Education Administration was just another layer of bureaucracy, and that they were not getting through like they had in the past. And so, the whole thing was dissolved.

Well, it sounds like what you are creating here is just like what was created in 1977. So how is USDA's current proposal to combine the same elements again, how is that different than what occurred in the Science and Education Administration in 1977?

Mr. BUCHANAN. Well, Senator, I think that what we are proposing is the merger of just ARS and CSREES. This would be accomplished by having only a single agency that would have responsibility for the research programs in the Department. Another very key part of that effort would be to have a single national program staff. At the present time, we basically have two research organizations within the Department—one in-house, our intramural programs; one extramural, or programs that support the land grant universities and other universities that have agricultural programs.

So I would see this as certainly quite a bit different from what you have mentioned that occurred in 1977. I am aware that there were changes made later that combined the Extension Service and the Cooperative State Research Service at the time which brought all of the programs that support the land grant universities together. But basically I think that what we are proposing would be a more simplified effort. It certainly would facilitate stakeholders from making contact for research. Rather than going to two separate agencies, they would go to one national program staff. And I think it would be beneficial from that perspective .

Chairman HARKIN. Well, I would like to take a look at it. I would like to just see what the differences are and why this proposal will be better than what we did back in the seventies. I don't know the details of your proposal from what you've said, but perhaps it will become more clear when my staff and I review the proposal on paper. I'm sure your proposal has its merits, but I do remember when we consolidated programs in the past and it did not work out so well.

Can I just ask you a couple questions about formula funds, Dr. Buchanan? We have several formulas under which USDA distributes research, education, and extension funding, and maybe the question I am going to ask, you cannot answer now, but I would appreciate it if you would answer it for the record, at least, anyway.

What are all the specific factors in each of these formulas? In other words, what data is plugged into each of the formulas? And, again, let me just tell you what I am getting at here. I understand the value of formula funds for what is commonly called "capacity building." I have been generally supportive of that over the years. But the formulas that we rely on go back a century or more, and I am just wondering if maybe we ought to look at the formulas we use.

How long have these formulas been in place?

Mr. BUCHANAN. Sir, I honestly do not know how long they have been in place, but I do know that they go back a long way.

Chairman HARKIN. Some to the 1800's.

Mr. BUCHANAN. Well, the Hatch Act of 1887 is what created the experiment station system, and I would assume that that is—some of them go back that far. But I think the thing regarding funding mechanisms, obviously we employ a number of different mechanisms for extramural programs through CSREES, and obviously it is common knowledge that the most popular way of funding in the future is probably going to be through the competitive process. This has certainly been the story that you are hearing more and more every day. But, clearly, there are roles for the formulas to play. In fact, the administration supports a balanced portfolio.

Originally, when the Hatch Act was passed in 1887, the formula money was supposed to be for experiment station directors in every State to address specific locals needs in that State. But over the years, things have changed a good bit, so that we are a much more integrated society now, and on problems we coordinate more. But there is still a role to play.

So I think the approach of the administration in taking a balanced portfolio of looking at different ways of funding research, certainly the NRI is a wonderful competitive program that has standards equal to any other agency here in town. My point, I guess, is that it takes different ways of funding research.

Chairman HARKIN. Well, again, would you supply for us—and maybe my staff can get this information from your office—just the names and purposes of the several formulas under which USDA distributes research, education, and extension funding; what are the specific factors in each of these formulas; in other words, what is the data that is plugged into the formulas.

Now, again, as you know, when the land grant schools were set up, the formulas were based upon the rural population in each State. But as you well know, our land grant colleges reach out way beyond State borders. You yourself came from Florida to go to Iowa State and then went back to Georgia. I mean, they blend all over the place. Stuff that is done in Georgia I am sure affects us up our way, and what is done at Iowa State affects ag research in Georgia.

So this old idea that is somehow bounded by rural population in States seems to me to be an old system that demands further examination. I must ask, is it time to re-examine how the formulas, right now as they stand, to meet the challenges of the day? You mentioned that the administration proposed a balanced program. I understand that. But just creating a balanced program does not, examine the underlying assumptions made in the formulas, and I am wondering if it is not time to take a look at just that. Any response on this issue?

Mr. BUCHANAN. Yes. One of the things that I would say is I certainly agree that different approaches to funding research is important. One of the things that we are doing is the development of the multistate competitive program using formula funds to encourage States to work together, because you are absolutely right, one of the great strengths of our system is the cooperative nature that we have by working across State lines. Many of the problems clearly are approachable more effectively by working together with different States, and so the multistate competitive program, by using

some of the formula funds in that light, is certainly a step in the right direction.

Chairman HARKIN. I appreciate that, Dr. Buchanan.

I yield now to Senator Chambliss.

Senator CHAMBLISS. Thank you, Mr. Chairman.

Dr. Buchanan, going back to this issue of consolidation of ARS and CSREES, I understand the idea would be to make it more efficient, consolidate requests for research and whatnot. What are you asking for now in this new proposal that you do not already possess from the standpoint of being able to make these agencies more efficient and operate in a coordinated way?

Mr. BUCHANAN. Well, Senator, what we really are asking for in the farm bill proposal is simply a framework. It is going to take a lot of implementation planning to really put the meat on the bones, so to speak, because all we have is a framework. And what we plan to do is in time develop implementation plans that includes representatives of both of the agencies to help us put the ideas together that will make it work.

The last thing I want to do is simply have a plan that then we try to force on people. I want this to be something that we all put together that would make our system stronger.

One of the questions that, in fact, you asked me during my confirmation as what did I want to do while I was here in my short term, and clearly I want to leave the research and education programs in the Department stronger than when I came. And I think this would be one of the ways that I could do that, by putting together a unified effort, and by merging areas in CSREES with a single national program staff, I think we would have a much stronger system in the future. And that is what I want to do, Senator.

Senator CHAMBLISS. Would you anticipate closing any existing offices, eliminating any personnel in that process?

Mr. BUCHANAN. That is a very important point, and I have tried to make it very clear that the proposal that I have on the table does not have any closures of facilities, that we are not looking at reducing personnel. I am simply looking at a new structure that would let us do a more effective job with the people we have got and the locations we have got.

So I do not anticipate this being the cause of any closure of facilities or any loss of personnel.

Senator CHAMBLISS. How do you respond to the criticism that if we consolidate these agencies into one agency instead of actually four agencies requesting research funds, we are now going to have one agency that is going to make the decision on where the money goes, and if it dominated by any one segment of the agriculture community, that one segment may get more funding and more projects devoted to them than other segments of the research community?

Mr. BUCHANAN. Senator, that is a question that a lot of our own people have asked, and I have tried to assure that I do not anticipate the reorganization as changing the balance between intramural and extramural because that is a very critical issue. But it is also important to recognize that I think that the importance of having the idea that everyone can work together, you will still have

the structure within the Department, and I make this point very forcefully, that we will maintain the administrator, the chief science administrator of the new agency. And, of course, that person will answer to an Under Secretary who answers to a Secretary. So we have checks and balances to ensure that we do not go off in left in any direction, just as we have now.

So while I tried to assure folks that this is not what I anticipate, and I think that what we are proposing would ensure that that does not happen.

Senator CHAMBLISS. OK. Let me ask you a sort of somewhat related question here. One of the critical aspects of agriculture that nature takes care of is the issue of pollination by honeybees. And I read some stories in the press in the last several days about honeybees across the Nation dying.

I have been a supporter of the North American Pollinator Protection Campaign in its efforts to highlight the importance and potential problems facing pollinators, including honeybees. Can you give us any idea about what is happening to the honeybees? And what is USDA doing about that right now to try to get some answers for our farmers across the country on this issue?

Mr. BUCHANAN. Well, I would like to respond in two or three ways.

First, I am very much aware of the problem with the honeybees and the die-offs, and it is caused by a problem, and there is a lot of research going on trying to address that problem at the present time. I would point out that the recipient of the outstanding research paper aware for the CSREES National Research Initiative effort was won by a scientist at Texas A&M University, and her research was involving honeybees.

We also have a major effort within ARS. Certainly when I was dean at the University of Georgia, the honeybee program was a major program, and we had a strong industry support in that State, as we do in many States.

Also, it is important in this Specialty Crops Initiative that so many of our specialty crops, and particularly some of our vegetables, depend upon pollination by honeybees. So I can see where this whole issue is going to continue to be a major challenge and one that I would hope that in the Specialty Crops Initiative we can probably carve out some money to help continue this effort.

Senator CHAMBLISS. I realize I may have caught you off guard with asking about this particular issue, but it is a critical part of agriculture. Would you mind just checking on that and giving us for the record what the position of the USDA is on this right now, what we know about it, and what we are doing about it?

Mr. BUCHANAN. We will get you some of the specific research that is underway and where we are and so forth. We would be glad to, Senator.

Senator CHAMBLISS. Good. Thank you.

Thanks, The Chairman.

Chairman HARKIN. Thank you, Senator Chambliss.

Senator Salazar?

Senator SALAZAR. Thank you very much, Mr. Chairman.

Let me say, Dr. Buchanan, I am excited and share your enthusiasm about the vision for renewable energy in agriculture and moving from food, fiber, and feed, to also add fuel to that equation.

My question to you has to do with the Agricultural Bioenergy and Bio-based Products Research Initiative. You have added $50 million annually, $500 million over 10 years. How did you come up with that amount of money as necessary to move forward with this Bio Research Initiative? And what are the components of what would be included in that $50 million annual outlay?

Mr. BUCHANAN. Well, certainly we identified this as one of the real challenges, and, of course, there are many, many others, but this was something that during my interim between retiring as dean and before I came here, I got interested in the energy picture. In fact, I took a group of farmers and county and State officials out to your State, visited NREL at Golden, Colorado. Then we went on to Nebraska and to Iowa and to Minnesota, looking at windmill farms, ethanol plants, and so forth.

So this was an issue that was cooking in my mind even before I became Under Secretary. And as we started thinking about for the farm bill this was certainly a topic that I wanted to see included, and it was accepted. And so this is a major infusion of resources that will help us be a player within the other parts of the Federal Government, certainly DOE and other agencies that are involved. And we want to be—I just think agriculture needs to be at the table and involved in developing how our Nation becomes energy independent or greater independence.

Senator SALAZAR. And I appreciate that, and I think you are going to find a great bipartisan support for moving in that direction here in the U.S. Senate, and I think in this Committee. My question to you has to do with how it is that you arrive at the $50 million figure. Why not $150 million? Why not some other figure? And if this program is funded at this $500 million over a 10–year period, what do you expect to be the outcome, say, after the first 2 years? If we spend $100 million in the first 2 years, what do you expect to see? So how did you arrive at this number? And what do you expect to see 2 years out if we fund it at this level?

Mr. BUCHANAN. Well, certainly the Department has a number of issues in the proposed farm bill that address this, certainly in forestry, also in rural development, and we have, I think, a balanced portfolio of requests. And this is a very bold request for our part, and I am delighted to support the $50 million. There certainly much, much more enhances the current funding we have in the area. So I am pleased that we have this in the budget proposal.

Senator SALAZAR. Let me push you just a little bit more. In terms of the $50 million figure, I realize it is an enhancement, something that I very much support. But is this a figure pulled out of the air that says we need to have an enhancement in terms of research with respect to biofuels? Or is there some meat under the $50 million-a-year dedication to——

Mr. BUCHANAN. One of the things that I have done when I was confirmed is that I hired a person to work with me in my mission area to really get a handle on what we are doing in the RE mission area in bioenergy. And that person is helping develop a plan as to what we would do, and I am pleased to say that we are developing

that plan as to be a part of the total energy research effort within the Government. We will be cooperating, obviously, with DOE and other agencies.

But I guess the thing I would go back to is that within the Department the $50 million a year or $500 million over 10 years is a very bold effort, and when you add that to the effort in rural development and they have a $500 million grant program, also a $2.1 billion plan for cellulosic ethanol, I think this is a very good approach and a very balanced approach to address what I think is a very important topic.

Senator SALAZAR. Let me ask you the same question with respect to the specialty crops. You have $100 million in your proposal in the initiative on specialty crops. How did you arrive at that figure? And what is the meat under that figure that says this is what we are going to do with respect to specialty crops?

Mr. BUCHANAN. Well, to start with, the specialty crops issue has emerged over the past few months, and certainly when the Secretary had the hearings all around the country, the specialty crop interests—and I think everybody is aware that there are about 60 percent of our farmers that do not participate in farm programs, and those are the specialty crop growers. And the common point that most of these folks made was that they wanted to be in the farm bill, but their interest was in three areas, primarily: first was research and education; the second was in phytosanitary issues; and markets and trade relations.

So certainly the research and development area was one that I was concerned about. We also had a NAREEE board, our advisory board to the mission area, and they had a specialty crops symposium this past summer in Chicago, and clearly it was made abundantly clear that the specialty crops interest wanted to see enhancement of research and education. And so looking at the magnitude of this effort—and, of course, when you talk about specialty crops, you are talking about a major segment of U.S. agriculture. Almost half or a little over half of the value of U.S. agriculture is in specialty crops. So this was a very bold figure, and I am pleased that the administration saw fit to include this in the farm bill proposals.

Senator SALAZAR. Thank you very much, Dr. Buchanan.

Thank you, Mr. Chairman.

Chairman HARKIN. Thank you very much.

Senator Casey?

Senator CASEY. Mr. Chairman, thank you again for your hearing today and getting us together on these important issues. And, Dr. Buchanan, thank you for your presence and your testimony and your public service.

I am from Pennsylvania, and we have not only a great agricultural tradition but it is a significant part, as you know, of our economy. We are very proud of Penn State in particular when it comes to some of these issues, the Cooperative Extension Program that that institution has had for years. They have done research on ways to increase agriculture profitability, trouble-shooting production problems, water and soil management, nutrient management, animal diseases, go down the list. And you know that.

But I wanted to ask you a question about your proposal today in terms of consolidation. What do you think is the basic difference between what you are proposing, to restructure research agencies, and what has been proposed by the acronym CREATE–21? Can you just give us an overview of the differences and whether or not—I guess the second part of the question is whether or not there is a way to combine the two proposals into one initiative.

Mr. BUCHANAN. Well, certainly there are a lot of similarities. In fact, when we started the planning for my effort, I have been briefed by both Dr. Danforth on NIFA as well as by the CREATE–21 group, and we listened to both groups. In fact, we spent a good bit of time studying and listening to what other people were saying, and so we did not start in a vacuum. We started by listening.

And I decided that we probably need to use some of the ideas that were brought forth, and I want to say for the record that by lifting up this idea, everybody should be commended for talking about the importance of these programs. So I want to compliment both of those groups.

But also I want to say that when we started out, I started with a letter to all people in REE, everybody that is on board, and I had three goals if we did any restructuring. Those goals were:

First, I wanted to improve the efficiency and effectiveness of our organization.

Another one, which is very dear to me, is I want to see us strengthen the relationship between the Nation's land grant universities and other universities with agricultural programs in the Federal Government. I think this is one of the great strengths of American agriculture, and I just simply want to see this strengthened.

And the third one was I wanted to enhance not only the quality but the recognition of the quality of science that is supported and conducted by the U.S. Department of Agriculture.

So those are the three goals that I had in mind, and what then we started to do was putting together a plan that would enable us to do that. And basically there are a great deal of similarities. There are some differences, and I think you wanted me to respond to some of those.

One is that we would—the plan that I proposed, the framework I would propose, maintains basically the structure within the Department. We would maintain the Under Secretary position. We would certainly have the—we would not have a separate entity. Of course, I think in some of the others it is a little bit different, but we would maintain the integrity of the organizational structure within USDA. I like to think that research and education is an integral part of the core mission of the U.S. Department of Agriculture, and I believe that with all my heart. So that is one of the things that I think is important.

Another difference is the entities that would be incorporated into any restructuring, and we have all included two: the ARS and the CSREES. Those are the two primary agencies. We do not propose to include the Forest Service and, of course, there are some real reasons for that, because some of their oversights come from different committees, and that I think is important. But also we do not include ERS, and, of course, the Economic Research Service is

another one of the agencies within the mission area I have responsibility for. And, of course, ERS does a lot of research, but they do a lot of other things as well. They are a national designated statistical agency and as such have responsibilities beyond research and education. So we chose not to include those two.

Also, the leadership in our proposal would be a chief scientist/administrator of the REES agency, the new combined agency. We would maintain the Under Secretary, who would have oversight and overall responsibility, who would report to the Secretary.

Another one is the Advisory Council. The proposal that we have, we would maintain the NAREEE Board, the National Agricultural Research, Education, and Extension Advisory Board, as is presently constituted, and, of course, there might be a different advisory group in the CREATE–21 proposal.

Also, we proposed to maintain the authorities that I mentioned in my opening comments. We would maintain the authority for Hatch, McIntire-Stennis, Smith-Lever, 1890, 1994, and Hispanic Serving Institutions. We do not propose to change those authorities at all.

So those are some of the highlights of the differences.

Senator CASEY. Thank you. I am in overtime.

Chairman HARKIN. Thank you very much.

Dr. Buchanan, I want to just probe for a little bit on the biomass energy proposal that we have before us from the administration. You mentioned you wanted to make sure that ag was at the table. I would just perhaps modify that a little bit and say that ag should be at the head of the table. We are talking about bio-based products and bio-based fuels. That is agriculture.

Now, DOE, fine, but, you know, the biggest portfolio, the biggest part of DOE's existence is managing our nuclear stockpile. That is their biggest deal. They manage our national labs. They do a fine job at that. And certainly they are involved in all kinds of energy, from coal to nuclear to gasification and a lot of other things. We are involved in bio-based energy, and to some extent wind, because I always tell people if you are going to build wind energy, you are not going to build it in the cities, you are going to build it on the farms, in rural areas, which is under the jurisdiction of Agriculture.

So when we talk about bio-based energy—and Senator Chambliss and I had a meeting with the President last week in the White House. What I got out of that meeting was very clearly that the President wants to move ahead on this. He is committed to it. He mentioned it in his State of the Union message, getting that 35 billion gallons, and I think he really wants to move ahead on this.

And so, I want to make clear an observation: we are dividing this topic between DOE and Agriculture, and I do not think that is healthy. I just do not think it is. You may say we have good relationships and perhaps we do, but I am not certain that that is a healthy way to start on this.

I would just point to the fact that in just trying to get out some of the DOE grants to some of our new biorefineries around the country, look how long that took. We know how to do it. Agriculture knows how to do that business. We have been in the loan portfolio business and grantmaking business for a long time. DOE

has not. That is not their job. So I am hopeful that the administration and the Congress working together will start to focus on what we have to do in USDA on this.

Similarly, I am wondering about the $50 million a year proposal you mentioned. Let me make sure I have got it here. Yes, dedicating $50 million annually for an Agricultural Bioenergy and Bio-based Products Research Initiative. Well, it seems to me that is less than what we are doing right now. That is less than what we are doing right now, if I am not mistaken. We had requested, $1.6 billion requested for the next 10 years, that is $160 million a year. So if you are only talking about $50 million, it seems to me this is a lot less than what has been proposed in the past. What am I missing here?

Mr. BUCHANAN. In fact, I had my staff look it up. We had about $21 million in ARS and about $6 or $8 million in CSREES in biomass and bioenergy this past year.

Chairman HARKIN. Say that again? How much was that?

Mr. BUCHANAN. I believe it was $21 million and $6 million in CSREES.

Chairman HARKIN. 21 plus 6, 27.

Mr. BUCHANAN. That would be a total of 27. So this would be a major boost, and I go back and say that the administration, if you look at the total farm bill, has a number of other areas in which we have proposed funding, certainly in rural development as well as in forestry. But I want to go back and respond to what you said earlier, and that is that clearly the area of bioenergy and bio-based products is the future of agriculture. We simply have to do our part to address that. And, of course, the ultimate source of energy is the sun, and as I pointed out in my opening comments, agriculture is converting the sun's energy through photosynthesis into something we can use, and we can use food, feed, fiber, but we can also use fuel. So, Senator, I am committed.

The other thing that I think is important is, while in your part of the world corn is clearly a high priority now and still and will be, we have got to look at other parts of the country. I do not think we are going to solve our energy issue simply by working in one part of the country with one or two commodities. We need to be looking at what we can produce on the High Plains of Texas——

Chairman HARKIN. That is right.

Mr. BUCHANAN [continuing]. And Southeastern United States and the Northeast, all over this country, if we are going to do what the President wants us to do.

Chairman HARKIN. Well, I had kind of a private conversation with the President last week when we were down there about that, and he gets it. He gets this idea about switchgrass and where switchgrass can grow, and the fact that switchgrass has as much protein as an acre—actually, I think more protein than an acre of soybeans. An acre of switchgrass has more protein than an acre of soybeans and has more energy than an acre of corn. So we need the research on how we get the protein out and then utilize energy. It is a conserving crop. It can grow in the High Plains of Texas and everywhere else. Then we had your guy from Georgia Tech up a month ago or a few weeks ago testifying about the wood pulp that can be used in the southern part of the United States. It is there,

just the existing wood pulp that was used for the paper industry that is no longer here, he estimated that that is about 4 billion gallons a year just from that of ethanol.

So I agree with you, this is the future and where we have got to go. But I guess what I—and my time is running out for my second round, but what I am interested in is your research portfolio. How has it changed over the last 5 years? Is it changing to take into account the needed research that we need, both basic and applied, in this area of bio-based energy? Is it affirmatively moving in that direction?

Mr. BUCHANAN. Yes, sir. There is no question about that. In fact, I want to give you a pre-publication copy of "Agricultural Research," and I will get copies for the whole Committee as soon as it is published. This is a pre-publication copy, but I want to make sure you get a copy of this. It lays out a number of things we are doing at ARS. We have comparable efforts in CSREES working with our universities, but there is no doubt in my mind, Senator, that we are moving in that direction. In fact, we have a number of—in fact, in fiscal year 2008, the budget has increases in biomass plus the $50 million annually in the farm bill. So we are moving in that direction.

In fact, you will notice in this book that a number of the different research projects and activities, for example, looking at cell wall—and, of course, you might wonder, well, what in the world has that got to do with bioenergy? But we have a major effort in looking at composition of cell wall because one of the—to get all that energy that you pointed out in switchgrass, you have got to convert not only cellulose and hemicellulose and those critters, but you have got to convert lignin.

Now, when you really want to start converting lignin into energy and get the energy out of that, you have got a real challenge on your hands. So maybe we can breed plants that have more cellulose and less lignin. Of course, it would not stand up very well.

[Laughter.]

Mr. BUCHANAN. But there are all kinds of things that you need to be doing that is in basic science in order to get to the applied application of it. And we are doing that.

In fact, I was out in Albany, California, back earlier in the summer and visiting with a cell wall group that is doing some of this basic type research.

Chairman HARKIN. So you are saying that right now, though, the total is $27 million.

Mr. BUCHANAN. It is $27 million, yes, sir.

Chairman HARKIN. Well, quite frankly, between you and me, and me and the rest of the world, that is just not enough. It is just simply not enough.

Mr. BUCHANAN. Well, we think that the $50 million additional, if that stays in the farm bill and becomes a reality, it will certainly be a step in the right direction.

Chairman HARKIN. Well, I appreciate that. It is a step in the right direction. But we have got to take bigger steps. That is just my own view, that we have got to take bigger steps than that in the farm bill. And I do not know how that is all going to work out.

But I have used up a lot of my time, and I would yield to Senator Chambliss, if you have any further questions.

Senator CHAMBLISS. I do not think I have anything further.

Chairman HARKIN. Anybody else? Did you have any further questions?

Senator CASEY. No.

Chairman HARKIN. Oh, there is one last thing I just wanted to ask you. You mentioned organic research, the $10 million that you are putting into organic research. I posed the same question to Secretary Johanns. Why did USDA not want to increase funding to organic agriculture given the increased need for price, yield, and overall production and marketing information? The current farm bill provides $3 million a year in mandatory funds for organics. But USDA's proposal provides $2 million annually over 5 years. That is how we get to the $10 million figure. So it is actually one-third less than what we already have in the present farm bill, and especially at a time when more and more consumers are demanding organics. I can go out to my local Safeway store where a year ago they had one little thing there for organic milk, and now it is one whole shelf. And people are paying for it. They are paying the extra money for the organics. Whole Foods told us that they cannot even get enough food to meet the demands. It is growing 20 percent—it is the fastest growing part of our food sector right now, is organized, 20 percent per year. But then when you meet with organic farmers and others that are doing this, there are a lot of problems out there in terms of package processing, small farmers getting it to regional processors, getting it out to the consumers. And so I just do not know how you justify basically cutting it by a third.

Mr. BUCHANAN. I think the answer to that, Senator, is we are not proposing to change the 202 program, but simply add to it an additional $10 million.

I would also say that there is a lot of other research that is applicable to the organic growers that is done in basic fertility and things that does not involve chemical fertilizers that would also be helpful to the organic producers that is not necessarily directly in this proposal.

Chairman HARKIN. So you are saying the $10 million is in addition to what we are doing now?

Mr. BUCHANAN. As I understand it, the $10 million is in addition to what is in the 202, as I understand it, Senator.

Chairman HARKIN. I did not understand that, and I appreciate that.

Well, I have some other questions, but we have another panel we have got to get to. I hope I can submit some questions for the record, Dr. Buchanan.

Mr. BUCHANAN. Yes, sir. I would be more than pleased to respond to any questions that you and other members of the Committee have.

Chairman HARKIN. And we thank you for your leadership.

Mr. BUCHANAN. Well, thank you very much, sir.

Chairman HARKIN. Thanks.

Now we will call our second panel up: Dr. Alan Leshner, Chief Executive Officer of the American Association for the Advancement of Science; Dr. Jeff Armstrong, Dean of the College of Agriculture

and Natural Resources at Michigan State University; Dr. William Danforth, who has already been introduced by Senator Bond, Chancellor Emeritus, Vice Chairman of the Board of Trustees of Washington University in St. Louis; and Dr. Francis Thicke, an organic dairy farmer from the Radiance Dairy Farm in Fairfield, Iowa.

Again, we will go in the order in which I mentioned your names. Again, all your statements will be made a part of the record in their entirety. If you could just sum it up in 5 minutes, we would appreciate that so we could get to rounds of questioning.

And so we will first turn to Dr. Alan Leshner, Chief Executive Officer of the American Association for the Advancement of Science, who is certainly not a stranger to me on my other Committee dealing with NIH over the years. Dr. Leshner and I have had many times when he has appeared before my other Committee over there in the past when he was at NIH. And so we welcome you to this Committee, Dr. Leshner. Again, if you could just sum it up in 5 minutes, I would appreciate that, and we will get to questions.

STATEMENT OF ALAN LESHNER, CHIEF EXECUTIVE OFFICER, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, WASHINGTON, DC

Mr. LESHNER. Good. Thank you. It is very nice to see you again, and thank you all for allowing me to be a part of this distinguished panel.

I would like to start us off with just a bit about the overall context and structure of the U.S. scientific enterprise of which agriculture is a critical part. I would argue American science is certainly among the best, if not the best in the world, and that its eminence derives both from the strong support science receives from many sectors of society and from the breadth of the U.S. research and development portfolio.

America's scientific leadership also is a product of a multifaceted system for both supporting and conducting research. Research comes from a broad array of Government agencies, philanthropic foundations, and industry. Some research is conducted under grants or contracts at individual laboratories and universities, research institutes and industrial settings, what we call extramural research. And other research is conducted intramurally within Government agencies in their own dedicated laboratories and contracted.

The success of American science has been a result of this kind of diversity in both the structure and the funding of our scientific system. With it all, the keystone of U.S. science across all fields has been the awarding of research support on the basis of what is known as peer or merit review. Awarding individual grants on the basis of peer review allows the Government and other funders to do the prioritizing of research areas in a general way, but also to have at the same time assurance that the highest quality science within those broad domains will be funded based on the judgments of top U.S. scientists. Peer review is especially important when funds are tight.

Let me next make some comparisons about how the major Federal R&D agencies support science. The National Science Foundation, whose primary mission is to support basic and applied research, is unique among agencies in not having any labs of its own. It has no intramural research. On the other hand, the National Institutes of Health has a research portfolio that mixes both intramural and extramural research, as does the USDA. Of the $28.6 billion in R&D that NIH received in fiscal year 2007, some 15 to 20 percent went to support intramural research conducted at the NIH Institutes, and the remaining 80 percent goes to support extramural research.

In contrast, the proportions at USDA are reversed. About 73 percent of USDA's R&D budget goes for intramural research, and just about 27 percent goes to extramural, typically academic research.

Concerning agricultural research, we consider it very unfortunate that, overall, USDA R&D has declined significantly in recent years. There was a big boost in funding in the early 2000's, but that was not due to increases in the actual conduct of research, but to strengthening security requirements at USDA labs that conduct research on dangerous pathogens like anthrax. Moreover, under the proposed fiscal year 2008 budget, USDA's R&D budget would fall another 10.8 percent from its 2000 final appropriation to $2 billion, mostly from proposed cuts in intramural research. There is more detail on the USDA proposed budget in my written statement.

But going back to the broader situation, the competition for Federal funding has become tremendously fierce regardless of the composition of any given agency's research portfolio, and that has become problematic. NSF, for example, funded less than 25 percent of the proposals that it received in fiscal year 2006, leaving almost $2 billion of highly fundable research unfunded. NIH, meanwhile, funds only about 20 percent of the extramural research proposals submitted, and the situation at USDA is even worse. The agency could fund only 16 percent of the proposals it received.

If one puts all this together, the aggregate of very high quality proposals that are declined every year represents a very rich portfolio of lost research and education opportunities, and it also sends a very discouraging message to those very bright young people considering science as a career.

Let me conclude by saying that in an increasingly science and technology-based economy that relies on federally funded research as the foundation for innovation, the need for a clear, sustained Federal commitment to a diverse portfolio of agricultural research has never been more obvious. Robust research funding is necessary to understand and craft solutions to pressing issues ranging from how to react to a changing climate to the development of national security tools to protect against emerging biological and agriculture threats, to ensuring a sustainable agricultural economy for generations to come. We know that this Committee has been extremely supportive of these efforts, and we applaud your commitment to it.

Thank you.

[The prepared statement of Mr. Leshner can be found on page 69 in the appendix.]

Chairman HARKIN. Thank you very much, Dr. Leshner, and for the next witness, I will call on Senator Stabenow.

Senator STABENOW. Thank you, Mr. Chairman, for allowing me to introduce a very important person from Michigan. And I must apologize for coming in late, but I guess I made it just in time here for this panel.

I want to make sure that Dr. Jeff Armstrong is appropriately welcomed. He is the Dean of the Michigan State University College of Agriculture, our oldest land grant, first land grant institution, Michigan State University, and not only growing up on a farm, but also having served in a number of different capacities. He came to Michigan State from Purdue University where he was the head of the Department of Animal Sciences, and he is serving nationally on the USDA board dealing with research and is co-Chair of the CREATE–21 Coalition. And, Mr. Chairman, I am pleased to be working with the coalition to introduce their recommendations for consolidating and focusing on research, and I look forward to working with you on this.

Thank you.

Chairman HARKIN. Thank you very much.

Dr. Armstrong, please proceed.

STATEMENT OF JEFF ARMSTRONG, DEAN, COLLEGE OF AGRICULTURE AND NATURAL RESOURCES, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN

Mr. ARMSTRONG. Mr. Chairman, Ranking Member Chambliss, and Senator Stabenow, thank you for that introduction. Thank you for the opportunity to discuss CREATE–21, the land grant system's proposal to improve the integration and efficiency of research, teaching, and extension activities funded through and coordinated by USDA.

Two years ago, a group within the land grant system asked the question: If we were going to build the agricultural system today, how would it look? We concluded that the current system is inefficient, with too many agencies. Also, we do not have the capacity or competitive funding to meet the new complex challenges we face today.

Let me provide an example that really builds on Secretary Buchanan's eloquent statements. ARS and CSREES both have national program leaders in food safety, animal sciences, water quality, natural resources, and the list could go on. CREATE–21 will consolidate ARS, CSREES, ERS, and Forest Service R&D into a new organization to be called the National Institutes for Food and Agriculture. It will more tightly integrate planning and implementation across all available in-house Federal and university capacity through a solution-based approach. It will double the authorization for food, agriculture, and natural resource research, teaching, and extension programs at USDA by greatly increasing the number of competitively awarded grants while also expanding our in-house ability and the land grant capacity with a special emphasis on the minority-serving and small land grant institutions.

Let me make a few statements about what CREATE–21 will not do. CREATE–21 will not take away congressional prerogatives to provide special research and extension rants to address local needs. It will not prevent Congress from explicitly directing funds to local ARS facilities, and it will not cut ARS funding levels. In fact, just

the opposite is true. We propose that ARS and other capacity programs would be guaranteed at the fiscal year 2007 base and we would see some increase.

Mr. Chairman, as the leader of this effort, I have been asked many times: How can you propose consolidating these agencies into a single organization and have the audacity to ask for more money? I think your comments and many others have really answered that question. The challenges and opportunities are generational in scope.

We have to put forward a plan that deals with our silos—we are in agriculture; we have silos—and also demonstrates the value of what we have to offer. If we cannot do that, then we get what we deserve.

Perhaps the best way is to give an example that has been mentioned many times: the bioproducts, biomass area. You know there are many goals to increase this. It is going to require a prodigious amount of effort and a systems approach. Let me remind you, Senator Stabenow, that you and Senator Levin visited Bruce Dale's lab, an eminent scientist in this area. At the end of the tour, Senator Levin said to Bruce Dale, "How can we move this cellulosic technology faster? How can we get it there quicker?" Bruce Dale stopped for a moment, and he said, "Two things. We need a billion dollars in fundamental research and we need a billion dollars that will allow us to do the systems approach, the extension work that is needed to connect everything."

Dr. Dale's assessment mirrors what our USDA Advisory Board recently said in a report to you, that we need the fundamental research but that we also need the extension and applied research. What we need is a single, well-funded organization.

The leadership of the land grant system believes that USDA's science programs are at a critical juncture. The current system is inefficient. It has served us well, but it must change. I cannot speak for anyone else, but I do not want to be sitting here at the table at the next farm bill talking about lowering our dependence on foreign food.

Mr. Chairman, in closing, let me say that the research and development system that has served food agriculture, forestry, and natural resources so well is no longer sustainable. Recent study results that are going to be released next week by the Farm Foundation document a substantial slowdown in farm productivity growth linked directly to reduced public sector funding. CREATE–21 would put USDA at the head of the table on topics like biomass and obesity. Our proposal encompasses the other two proposals.

Clearly, if we do not solve the problems and seize the opportunities, our institutions will become more and more detached from the very people they were created to serve. They are in an environment, as you heard, competitive environment. They will move to other models. They will move from a dairy cow model, which is important in Michigan, to a rat or a mouse model because they are in an environment that thrives on competition. Let's not let that detachment occur. Let's enact CREATE–21.

Thank you so much for placing this important topic on the table. I also want to thank Secretary Buchanan and Chancellor Danforth

for their efforts in putting this important topic on the table. There is much that we agree upon.

Thank you very much.

[The prepared statement of Mr. Armstrong can be found on page 48 in the appendix.]

Chairman HARKIN. Thank you, Dr. Armstrong.

And now we turn to Dr. William Danforth, Chancellor Emeritus and Vice Chairman of the Board of Trustees of Washington University, who was very eloquently introduced earlier by Senator Bond. Welcome, Dr. Danforth.

STATEMENT OF WILLIAM DANFORTH, CHANCELLOR EMERITUS, VICE CHAIRMAN OF THE BOARD OF TRUSTEES, WASHINGTON UNIVERSITY, ST. LOUIS, MISSOURI

Mr. DANFORTH. Thank you, Chairman Harkin, Ranking Member Chambliss, and members. I appreciate this opportunity. I am William Danforth, and I have been introduced. I have been involved in biomedical research for 50 years and plant science for about a dozen; in other words, I have moved from trying to worry about saving lives retail to saving lives wholesale.

Despite its enormous potential, agricultural research is, in my view, underappreciated, underfunded, and not managed to make best use of the Nation's scientific talent. Fortunately, we know how to fix this. For over 30 years, scientific panels have argued for more competitive, merit-based grants, but traditions have made change hard. Thanks to many, I chaired this task force that has been described. Our recommendations are embodied in a report here, which I would like to include in the record of today.

Chairman HARKIN. Without objection.

Mr. DANFORTH. Our recommendations are embodied in the National Institute for Food and Agriculture Act, introduced last year by Chairman Harkin and Senators Bond, Lugar, Coleman, and others, and in the House by Chairman Peterson.

Our conclusions were a few basic ones: Continued agricultural innovations are essential. Past innovations have been very successful, giving us food that is plentiful, cheap, and safe. Innovations must continue because of a number of challenges that have been mentioned several times today, and I will not repeat them, but they are very serious.

Second, modern research into the fundamental nature of farm animals and plants is essential to meet these challenges. Fortunately, new understandings and technologies from cell biology, molecular biology, genetics and so on are as usefully applicable to plants and farm animals as they are to human medicine.

Third, American knows how to manage and fund fundamental research. The National Institutes of Health and National Science Foundation have long done so with practical benefits. They just invite scientists to submit competitive proposals to meet national priorities. Grants are awarded to the best proposals as judged by a confluence of scientific merit and national need, and that is all there is to it. The system is in keeping with the American tradition of competitive free enterprise.

Agricultural research has long been underfunded. The NIH spends almost $14 to $15 for research for every $1 spent by the

USDA and about $150 in competitive peer-reviewed grants for every $1 so awarded by the USDA. Because NRI grants of USDA are smaller, of shorter duration, and carry lower overhead than do those at NIH and NSF, scientists with agricultural interests are tempted to opt for NIH or NSF programs rather than those essential to agriculture.

Our proposals are narrowed and focused. They are designed to expand and enhance USDA's important fundamental research. They are designed to have more scientific input into decision-making at all levels, which is especially important in the fundamental research area where the science is not easily understood by even the most intelligent lay people.

Our proposal does not touch existing research authorities, but separates the new area so that it might develop its own scientific culture. I would add that our charge did not include considering larger restructuring.

Recognizing the chronic underfunding of competitive agricultural research, we recommend new money so as not compete with the ongoing programs which we respect. We recommended mandatory funding because we believe that a new way of doing things has had a hard time getting started, and started well, and needs protection for a number of years.

If nothing is done, we worry that America will lose its competitive edge to cheaper land and low-cost labor, will not capitalize optimally on our opportunities for bioenergy or to protect our health and environment, cost of production will likely rise, and future farm program spending escalate.

So, Mr. Chairman, we strongly recommend the adoption of the National Institute for Food and Agriculture in the research title. Last year, at least we had the support of a number of key groups when it was introduced, including the American Soybean Association, the National Pork Producers Council, the National Farmers Union, the National Corn Growers Association, and the National Chicken Council. This small investment will reap returns for farmers and ranchers and the Nation.

Thank you.

[The prepared statement of Mr. Danforth can be found on page 64 in the appendix.]

Chairman HARKIN. Dr. Danforth, thank you very much, and again let me thank you and, through you, the members of the board that was set up by the 2002 farm bill to conduct this review. I can assure you that your findings I believe are going to form the basis of how we move ahead on this. I thought you did diligent work, and I really appreciate it on behalf of all of us who were involved in putting that into the 2002 farm bill. So thank you very much for that.

Mr. DANFORTH. Thank you, and thank you for putting it in.

Chairman HARKIN. Well, we will have questions later.

[Laughter.]

Chairman HARKIN. Now I get to introduce an Iowan. Dr. Francis Thicke has the Radiance Dairy Farm down in Fairfield, Iowa. He grew up on a dairy farm in Minnesota, then decided to come to the southern climes in Iowa, get rid of those Minnesota winters up there. He has a B.A. in music and philosophy, but he returned to

school to get his M.S. in soil science and a Ph.D. in agronomy from the University of Minnesota. He had a position with USDA with the Extension Service here in Washington, and he worked with sustainable agriculture programs as the national program leader for soil science.

So, again, with that introduction, I just might also say that he was named a fellow of the Food and Society Policy Fellows Program from 2002 to 2004, and so we welcome a hands-on organic farmer to our panel today.

Dr. Thicke?

STATEMENT OF FRANCIS THICKE, RADIANCE DAIRY FARM, FAIRFIELD, IOWA

Mr. THICKE. Thank you, Mr. Chairman and members of the Committee. I appreciate this opportunity.

As you said, I have been a farmer and I have been a USDA bureaucrat and then back to farmer. I like to call myself a "born-again farmer."

[Laughter.]

Mr. THICKE. Incidentally, when I left USDA, my colleagues were astounded that a USDA bureaucrat would actually think about going back to farming. But I say that facetiously because there are many dedicated people at USDA, and they are still my good friends.

The previous speakers have made a good case for the need for more research funds for agriculture. As you said, Mr. Chairman, it has been flat for many years. I would like to focus a little more on applied research, integrated systems research. As a farmer and a former extension person, I want to focus on that. And probably a good example of that is the IFAFS program, the Initiative for Future Agriculture and Food Systems, which was funded by this Committee—or created by this Committee in 1998, at a mandatory $120 million per year. And in the 2002 farm bill, it was increased to $200 million.

Well, this has been an ideal program. broadly supported. I say "ideal" in the sense that it is interdisciplinary; it involves producers on the ground; it solves problems on the ground. It is an outcome-based program. Unfortunately, over the years the funding has dwindled. Now it is at about $35 to $45 million a year. That is an unfortunate situation, and I would like to see that reversed to bring it back up in the new farm bill to the $200 million mandatory funding level. And I do not see it as competition to the basic research we have talked about here. I think the two programs can be side-by-side, coordinated, parallel programs.

Let's look at a couple of points from my written testimony. listed are some of the priorities from the previous IFAFS program and some new, additional priorities I would like to see added. I will mention two of them. One of them is related to sustainable energy production, biofuels. We have talked a lot about that, and I think we are at a tipping point here now. We are pushing—in the Midwest, for example, our farming systems we could tip to become less sustainable, and we could—if we go into cellulosic perennial crops, we could actually make it more sustainable and still produce fuel at a more efficient rate than with corn and soybeans. So I think

we are at an exciting place. We could go the wrong way. We could just start to take all the corn stalks off the cornfields and end up with eroded soils, end up with more nitrate leaching, more hypoxia in the Gulf of Mexico. Or we could go the other way, grow more perennials, and we could actually reduce these environmental problems. I think that is an important thing we need to be concerned about.

Another point in there is support for public plant and animal breeding. With all the emphasis on genomics and biotechnology, we have neglected classical plant and animal breeding. We have come to the point where we not only have few scientists in the universities that are doing this, but we are losing our diversity, our basic diversity of plant and animal genetics. We have to be very careful here. I think we need to put more emphasis on classical plant and animal breeding.

Another point I want to talk about is organic research, education and extension. Actually, just last week I was in Washington to be on the review panel for the Integrated Organic Program grants program, and we reviewed about 60 research proposals. It was very exciting to see some of the research that is being done there, looking at farming systems as models of ecology, looking at how these ecological systems can regulate soil fertility, protect plants against insects and diseases, so actually circumvent the need for pesticides and synthetic fertilizers. This is really exciting research.

Somebody mentioned earlier that conventional research actually can spill over to organic, but I think the spillover is even greater for—of organic research spilling over into conventional systems that can help to prevent environmental problems as we go down the road.

Here I would speak on behalf of many organic organizations to say that we need to increase that. The organic food market is now about 3 percent of the food market. Organic research is about six-tenths of 1 percent of the research funding in USDA. If we were to do it on an equivalent, fair-share basis, we would be talking $120 million of organic research, though I am not bold enough to quite say that. But I think that $40 million per year between ARS and CSREES would be a good target for research—per year for research on organic farming.

Two more things I would like to touch on quickly. One is the SARE Program, Sustainable Agriculture Research and Education Program, funded by the 1985 farm bill. It has been funded for 20 years. The farm bill said it should be funded up to $60 million. The highest it has got is $19 million, and it now has dwindled back. We are coming up on the 20th anniversary of this program. It is fitting that we should shoot for $20 million funding for the fiscal year 2008 budget for SARE. That has also been an ideal program that has helped farmers be linked with researchers.

Finally, I want to mention ATTRA, the National Sustainable Agriculture Information Service, which, as you know, has been zeroed out this last—in fiscal year 2007. This is a program that has been funded for 20 years. It has provided tremendous service to farmers, and suddenly it is being treated as an earmark. And we all know that is a mistake, and we need to reverse that mistake. ATTRA just last year, 2006, responded with mailings to 37,000 farmers

across the country answering technical questions. It is a national program. Six hundred seventy-three thousand public documents were downloaded off the Internet from that program. If we lose that, we are losing an incredible resource for farmers across the country.

I will end with that. Thank you.

[The prepared statement of Mr. Thicke can be found on page 80 in the appendix.]

Chairman HARKIN. Well, thank you very much, Dr. Thicke, and I thank the entire panel.

First of all, Dr. Leshner, in your written testimony and in your verbal testimony, you compared research at NIH, NSF, and USDA. To me, the big piece missing from USDA's research portfolio—and you have probably gleaned that from what I said to Dr. Buchanan earlier—is the proportion of funds going to competitive grants. Agricultural research's base, the land grant institutions and extension, are funded by non-competitive grants, and there is a fear that if we put additional money into competitive grants, we will shift money out of extension and education.

So, Dr. Leshner, you can provide an outside point of view on agricultural research since you have had extensive experience, as I mentioned earlier, at the National Institutes of Health and at the National Science Foundation, but not at USDA. How does AAAS view formula funds and competitive grants? Is there a value to funding research through both formula funds and competitive grants? And do you prefer one type of funding approach over the other?

Mr. LESHNER. Well, let me start by saying I think that the formula approach has been historically very productive in establishing infrastructure throughout the country for doing agricultural research and that it has provided a very important base of facilities and equipment and things like that.

However, having said that, my view—and I believe the view of the vast majority of the scientific community—is that the core of scientific progress comes from competitive, peer-reviewed grants. Scientists are notoriously argumentative and competitive, and, in fact, that competitiveness has, in fact, been one of the mainstays of the successes. So my experience has been that the core of research funding really should come from competitive, peer-reviewed grant support.

Chairman HARKIN. Well, now we go to Dr. Armstrong, one of our great land grant colleges. First of all, the land grant proposal to change agricultural research extension and education seems to prioritize formula funds and intramural ARS funds over competitive funds because it sets our current appropriations level as a base, with any money above that base going to competitively awarded grants.

Do you believe that this order of priority is the correct one, that is, giving the highest priority to preserving formula and intramural funds?

Mr. ARMSTRONG. Well, thank you, Senator Harkin. I guess I would respectfully disagree with the characterization. I believe what we—I look at it, and I think back in my past growing up as a three-legged stool, sitting down to milk a cow. That represented

in the panel the competitive funds, but there are two legs to that: the integrated systems approach that Dr. Thicke mentioned, as well as the fundamental approach that Dr. Danforth mentioned. The third leg being capacity.

Now, someone in OMB asked me: Well, we understand the geographical differences, et cetera, but do you have to have everything everywhere? Well, with our system being better integrated with the proposal that is common to the Secretary of Ag and Secretary Buchanan and our proposal, we would be more efficient.

So we are wanting to bolster the capacity, the intramural, and the formula funds—only slightly grow them, slightly above inflation. So I would view it as not prioritizing but bolstering something that has been going downward when you look at dollars based on an inflated basis. And so we are turning to much more competitive, but a key point of our proposal—I think Dr. Thicke hit it—is the integrated systems approach. We need this.

A little prop. The latest issue of Time: "Forget Organic, Eat Local." I am not trying to make a statement of what is right or wrong, but the systems approach that we need to look at the interface of wetlands, the environment, with the new bio=economy, that requires extension work, that requires applied research and fundamental research. So I view our proposal as being balanced in that regard.

Chairman HARKIN. If I might, Dr. Armstrong, what I hear from the countryside—and I did not see that picture on Time Magazine—is that the old systems of the non-competitive grants, the formula grants, the way the structure is set up just does not move rapidly enough to address the new dynamics that are out there, either in food or in energy; and that if you have competitively awarded the grants, then you have the sort of thing that Dr. Leshner is talking about, you have people out there vying for this and saying this is the new stuff and we want to compete for that.

And so that is what I hear a lot of, and that is why I raise these questions, because what I am hearing is that the intramural system, the non-competitive grant system, may have served its purpose for a time in terms of capacity building. But if we are going to move aggressively ahead in both energy and the new types of foods that people want, we need to move more aggressively in competitive grants.

Mr. ARMSTRONG. Well, I am not disagreeing with you, and you fit well into our debate that the land grant system has had for the last 2 years. We have some individuals that wanted to make all new money competitive, and some wanted to bolster the formula and the ARS funds even more. But the key point is that we agree we need more competitive. What we are arguing, a difference—and "argue" not being a bad word—is the base of the capacity needed to sustain what we are doing. We need to have those plant pathologists. We need to have these other individuals working in those models.

So I am agreeing with you. I think there is a degree. Our proposal would take the proportion that Dr. Leshner mentioned and move it to a 50–50, fully authorized and appropriated, 70 cents out of every new dollar would go to competitive. And we put that on the table as certainly a debatable point.

But I think as you indicated earlier in discussing biomass and bioenergy, the levels we are talking about are not enough, and we need more in competitive funding. I would agree with that. But we really will lose a lot of diversity in our system and our minority-serving institutions if we do not bolster the base, especially for these institutions.

Chairman HARKIN. Are you familiar with, have you looked over the proposals that came out of the Commission that Dr. Danforth headed? Have you looked over those proposals?

Mr. ARMSTRONG. Yes, sir, and, in fact, we greatly admire those proposals. One of my dear friends, Vic Lechtenberg, was one of the members; And, in fact, we called to CREATE–21 NIFA Plus early on because we viewed NIFA as being so fundamentally important and needed. But we believe we needed two other things: the capacity bolstering and the integrated IFAFS—Dr. Thicke could not have put it better—the IFAFS proposals. We need that as well, in addition to what Dr. Danforth is proposing.

Chairman HARKIN. I have more questions on this topic for myy next round, but I have gone over and I will recognize Senator Chambliss.

Senator CHAMBLISS. Thank you, Mr. Chairman.

Dr. Leshner, you are familiar, I am sure, with the fact that in ag we are continually arguing over whether or not basic versus applied research is the better route to go. You have experience as an agency head, a scientist, a policy expert. Give us the benefit of your thought as to how we balance basic versus applied research, particularly in agriculture.

Mr. LESHNER. If I could say, if you could figure out the right formula, I could get you published in Science immediately.

[Laughter.]

Senator CHAMBLISS. That is why we have got you here.

Mr. LESHNER. But I will say that in the rest of the scientific community we have been having exactly that same debate of what that balance ought to be.

There actually are three pieces to it from my perspective. There is a fundamental research piece—and there is no future, there is no ultimate new technologies without a base of fundamental science. So there is a fundamental research piece. Then on the other end there is that applied research piece we all want. But there is one more piece that is extremely important, and that is in the middle. It is a process now being called "translational research." But it is the process by which you take fundamental research findings and move them into applied research.

Now, I apologize that I cannot give you an appropriate formula to it, but we need to be attending to all of those three simultaneously. And, again, from my perspective, peer review is the best way to help set the priorities within areas, but across areas I think the proportions shift over time. There is no magic number at any one time.

The experience at NIH is a very interesting one. Frankly, up until the early 1990's, NIH actually was not doing quite enough basic research, increase of the basic research portfolio. But then around the turn of the century, there was a need to move more into translational and clinical research, and they have chosen to put

more emphasis in that direction. So I think it requires a sort of integrated monitoring and, therefore, frankly, the idea of having a unit that can do that monitoring across all domains, and methods of supporting research sounds very attractive to me, although I do not know all the details so I cannot comment on those.

Sorry for the long answer to a short question.

Senator CHAMBLISS. Dr. Thicke, you are a producer. These gentlemen are experts in policy. Dr. Buchanan is a policy expert. But at the end of the day, it is the guy that gets his fingernails dirty that has got to take all this research and all this theory and use it on his farm.

You have been a bureaucrat. You are a producer. Tell us, if you will, if you could change any one thing we do in ag research or any one policy, as a producer, what would it be to help you more in your day-to-day activity on the farm.

Mr. THICKE. I think that we need a lot more working directly with producers. Take the examples of organic farming or grazing. Grazing is an example where producers in the Midwest and throughout the country came up with this grazing system, very innovative, that is working very well, and then the researchers at the land grants started to look around and say, "What are these guys doing? We do not know what they are doing." And those researchers who came out on the farm and actually worked with the farmers were very successful in helping the farmers to progress. Those researchers who stood back and said, "I am going to research this little part here or this part here," they did not really contribute so much. So I think that we need to have more direct, on-the-ground work between farmers and researchers.

For example, the words "translational research," I question a little what that means. It sounds like top-down, that we are going to create the results in the lab and then we are going to bring it to the farmers. And I think it does not work that way. I think it is more of a top-down, bottom-up, integrated approach that we need to be looking at for agricultural research to help farmers.

Chairman HARKIN. That is a good thought.

Dr. Danforth, your proposal would add a new program, presumably with its own staff, to the existing ag research structure. Do you think your proposal can succeed in the existing structure? Or would it do better in a consolidated and reorganized structure, as has been proposed by USDA and the land grant universities?

Mr. DANFORTH. I do not think I am particularly competent to make that—to draw a conclusion. I would say this: that we were so worried about protecting competitive research because we felt that the USDA—if I could just make a little longer answer to that question.

The National Science Foundation makes almost all of its grants competitive, and that is true because what they study is the same all over the world—chemistry, physics, and so on. The National Institutes of Health is about 85 percent competitive, so it has to—and medicine has some more local components to it.

Agricultural has very strong local components to it, so you need both. And in our view, the local things have gotten really well funded compared with the fundamental research, and the fundamental research has changed a lot and needs a new approach.

So we felt that, however it is structured, the fundamental research needs protection, and it needs to develop a new culture within the Department. And that is why we recommended having something that was separate. We felt if it were not separate that it might just sort of flow back into the general decisionmaking pool and get neglected.

I appreciate the chance to try and explain that.

Senator CHAMBLISS. Just a comment about one aspect of your proposal. I notice you have got an advisory board of 25 members, including farmers as well as researchers. And my best friends are farmers, and what I have always found is if you want 10 different opinions, ask 10 different farmers a question.

[Laughter.]

Senator CHAMBLISS. I am wondering how in the world we are going to take 25 folks, most of whom are farmers, and have them advise anybody about a general—or reach a general conclusion. But it is an interesting proposal and great work you have done.

Mr. DANFORTH. Can I add, I just—thank you. I would like to say the reason we did that—we did not say "farmers." We said "stakeholders," which might include farmers and grocers and others. But the reason we did that—you asked the question about decisions between fundamental and basic research—or basic research and applied research and so on. We think that those decisions are best made face-to-face confrontation between scientists and those who need the research, the kind of thing where there is actual contact. That is pretty well done in some of the NIH panels. And if you had that, then you can argue things, like the scientists can say, "We want to do this," and the people will say, "We do not need all that. Why do you want to do that?" The people who use the science can say, "You have got to solve this problem." The scientists can say, "We understand, and we would like to, but that is beyond today's science. That is going to have to wait until we do other things first."

So if you want to have the best policies, we felt that bringing these people together to argue them out would be a good thing to do.

Senator CHAMBLISS. Very much like what Dr. Thicke says, getting down to the local level.

Mr. DANFORTH. Right.

Senator CHAMBLISS. Dr. Armstrong, relative to CREATE–21, obviously there is a lot of enthusiasm in some parts of the research community about CREATE–21. I would like for you just to take a minute to explain a little bit more about the process that the Land Grant Association went through to develop CREATE–21, who was involved, who voted on this, who was entitled vote, and what does that vote tell us. We know the criticism of the program. You know the criticism. Tell us how you respond to the criticisms that are out there.

Mr. ARMSTRONG. A couple of years ago, we put together a small group to ask the question how would we do it again. Part of that was precipitated by the President's budget that would have taken Hatch dollars and moved it to competitive. And that would have been very devastating for the system because that capacity of that base, especially in the research area, has been explained, needing

to have dairy work done in one State versus another. And we have discussed that.

The group enlarged, and if you look at NASULGC, it represents 76 universities that are land grants that are in this particular group. NASULGC is actually representing over 220 universities around the United States. That group includes veterinarians, individuals interested in human science, different boards. I will not bother you, you know, with the structure of NASULGC.

Senator CHAMBLISS. Sure.

Mr. ARMSTRONG. Last year, around August, we had a vote, so every land grant university—1994, 1890, historically black, the 1862—had five to six votes. So Scott Angle and those at University of Georgia had five votes. Roughly 400 ballots were cast. Two-thirds of the people responded, which is a high rate for our group. It is normally about like a Presidential election, 50 percent. And 86 percent responded in favor of the proposal. And we had a lot of discussion, multiple conference calls, some conference calls with over 100 people, about this very discussion that the Chairman and I were having earlier: What is the balance—or what we are all having: What is the balance of the formula and the competitive? We sided on majority competitive.

One of the major criticisms I addressed in my testimony has to do with ARS. ARS is a wonderful organization. We are not proposing to take away that intramural arm. I have worked with ARS scientists. We have them at Michigan State. We want to see programming and planning at the national level better coordinated and move things together at that level. We would not take away any facilities. That intramural research is especially important for agriculture and natural resources. Being able to move, dealing with at avian influenza, issues related to our health, we need that. And we would not disparage that at all.

Senator CHAMBLISS. OK. Thank you very much.

Thanks, The Chairman.

Chairman HARKIN. OK. Thank you, Senator Chambliss.

Senator Stabenow?

Senator STABENOW. Thank you, Mr. Chairman, and thank you for your leadership on this. This is so important—and Senator Chambliss as well.

Just to follow up with Dr. Armstrong, you started to answer with Senator Chambliss what I was going to ask you in terms of the debate in terms of funding capacity versus the competitive funding. And it is my understanding that you are suggesting a base and then 70 percent—is that correct?—above that would be competitive grant funding. Could you speak just a little bit more about why you think that having that capacity funding should be protected as part of this while you are also recommending competitive funding on top of that. But could you just talk a little bit more about that?

Mr. ARMSTRONG. Well, certainly. First, Senator Stabenow, thank you for your leadership and support.

One would be extension, that capacity. Extension is so important. It really translates—we are in the knowledge business, and extension takes the knowledge—whether it is generated on that campus or an ARS, it takes it out to the field. And it also reaches a broad

range. It impacts Detroit in Michigan as well as it does Sanilac County. So it is very critically important.

That capacity is needed—not to bolster that capacity to a tremendous amount, but let's stabilize it and let's get slightly above inflationary increases. So if you look at our proposal over the next 7 years, for Michigan State University or ARS, there would be a 29–percent increase in funding over 7 years. That is above inflation, but that is well above the 3 to 6 percent we have seen in the last 9 years, cumulative. So that base needs to be bolstered.

Now, I said 29 percent and not 30 percent because we take 1 percent and we put it toward the small 1862s—which we believe we need to have in the States. Agriculture is different, natural resource is different in every state—and our minority-serving institutions. So that small percentage translates to about 150–percent increase to the 1994s and around a 75–percent increase for the 1890's.

Our USDA Advisory Board reviewed the minority-serving institutions last year, and we heard from the 1994 and the 1890, and believe me, the capacity really needs to be bolstered at those institutions to bring along the partnership.

The other point is the integrated systems approach competitive funding is needed as well to round out the picture, the balance.

Senator STABENOW. Thank you very much. I am going to have to leave. It does not reflect my interest level. But I appreciate all of you very much and your work.

Senator CHAMBLISS. [Presiding.] Senator Thune?

Senator THUNE. Thank you, Mr. Chairman, and I want to thank the people who are here today to testify for your input on this, and you have invested a lot of time and energy into coming up with strategies that make sense in terms of where we put research dollars. This is a farm bill that is going to be important to the agricultural community and all aspects of it, and there is a lot—I have talked with farmers and ranchers across my State for some time about it, and, of course, was a real interest in making sure that we have got a reliable safety net in place for our producers. And we talk about conservation and energy development and the commodity title probably the most, but research is a critically important part of this farm bill, and it is critically important to the future of agriculture and, frankly, bioenergy, which has become a big area of research and one that I think is going to yield some big dividends down the road.

So thank you for the good work that you put into giving us some insights and ideas about how to proceed and what type of a model works the best.

I have, in visiting with South Dakota State University, our land grant university in South Dakota, they support the CREATE–21 approach, and I know that there are a couple of others that are on the table as well, including one that was put forward by the Department of Agriculture.

But that being said, I think coming up with the right balance between how we deliver competitive grants, coupled with the proven success that we have had with formula funding, how much of the funding is available for direct program funding through perhaps block grants or that that would come through the annual appro-

priations process, those are all decisions that we are going to have to deal with here as we put this new farm bill together.

So, anyway, I would like to just, if I might, focus a couple of questions with regard to some proposals that are out there.

We have had a lot of, hundreds of millions of dollars now going into bioenergy research and development and certainly having billions more will be spent in the future. At least I hope that we are spending the amount of money we need to, to continue to develop what is an incredibly important success story in rural America and when it comes to our energy security.

But the primary agencies that have been responsible for that have been USDA and the Department of Energy. How are these agencies working today in terms of coordinating that research? And how would creating a new Research, Education, and Extension Service help or hurt that coordination? And I guess I would pose that to any of our panelists.

Mr. ARMSTRONG. Thank you.

Senator THUNE. Dr. Armstrong?

Mr. ARMSTRONG. Yes, thank you, Senator Thune. I will take a shot at that, but that is certainly a question for Secretary Buchanan.

I think it would enhance the ability because we would have more focus. We would have one program leader in that particular area, and it would allow us to move forward. I think DOE is certainly—I know several universities have been working on some center grants that really gets at the fundamental aspect of cell walls and cellulosic. That work will come along, and it needs to be coupled with extension and translational type of research to get that applied. So that is one example.

I also think it is related to—you know, our chemical engineer, our specialist at Michigan State, I asked him, What if 20 or 25 years ago the Federal Government had invested competitive funds in a systems approach and in the fundamental approach to cellulosic 20 or 25 years ago? And he commented that he thought we would have less than $1–a-gallon fuel today, and profound impacts on rural South Dakota, rural Michigan, et cetera. So that is a very important aspect.

So I would bring in the—I think it would enhance the collaboration. That collaboration is occurring, certainly—so I am not saying that that is broken—between DOE and USDA.

Senator THUNE. Does anybody else want to comment on that? Dr. Danforth?

Mr. DANFORTH. I would just say that I think realistically this is a very long-term effort and is very, very difficult, and we just cannot overlook that, and it is going to take a lot of fundamental research, too, and the best scientific minds to try and solve some of these very difficult and challenging questions.

Let me just say at the simplest level we cannot have biofuels without greatly increasing productivity per acre. You know, that sort of work needs to go on, and that definitely, it seems to me, is a USDA challenge, but it also involves a better understanding at the basic level of how plants grow, why they need more water or less water, and how one affects that and so on.

One also wants to look at growing crops that are easier to convert to energy. You can imagine more energy, useful energy, in corn kernels and so on, or oils in soybeans. That is a big problem because at the moment NAFTA, at least is a net importer of vegetable oils. And then better attacks on how to convert cellulose to energy, not an easy problem, or lignocellulose to energy, an even harder problem. These are going to require lots of people working on them. They are in the kind of—I would put them as sort of solving certain kinds of cancer. You know, you just—we need to know a lot more before we are going to solve them efficiently to get low-cost fuels in sufficient quantities to ever get to $1 a gallon.

Mr. ARMSTRONG. Just to follow up, and this is related to industries important to your State, and Dr. Thicke mentioned it, the long-term genetic breeding work that we need. The wheat growers, I met with their board a week or so ago, Darren Coppock and others, and they had some questions about CREATE–21; They were concerned what is going to happen with the capacity, the ability to do the long-term breeding research.

I would contend that if we do not have a balanced portfolio and we have the minimal amount of funding that we have now, we force scientists into either/or. And they have to make a decision that is deeper than competing for the grant. They have to decide where they are going to compete. And so if the only funding is available in the biomass and in the other hot areas, they move to that direction, and they are not there to do the wheat breeding or the classical genetics work that is very expensive but very important to particular industries.

So it is a balancing the portfolio perspective that is very critical.

Mr. THICKE. Could I make a point on that?

Senator THUNE. Yes.

Mr. THICKE. I do not have a dog in the fight, really, between formula funding versus competitive grants. But as a farmer and having worked on a national level in extension, I worry about what would happen if formula funds were gone completely, because some of the small States would not compete well. I know that from working in the competitive grant systems. What we would find is some huge universities would get huger, and the money would flow to few places, and it would get lost elsewhere. I know that would happen. It is just something to think about.

And one little aside on the ethanol thing, I did a quick calculation. About 3 percent of our gasoline use comes from ethanol. Now, if we increased our miles per gallon by three-quarters of a mile per gallon, we would save as much fuel as the ethanol we produced. And so you as Senators have to look at that. I would urge you to look at that. A couple miles per gallon, from 25 miles a gallon to 27 miles a gallon, we could eliminate much of this 35 billion gallons of ethanol that President Bush would like us to produce. I mean, that is a very important thing. It is like an elephant in the room we are ignoring.

Senator THUNE. I guess the other question I would have, and this has to do with the current research structure at USDA, one of the—at least what I hear stakeholders talk about is that it incorporates a lot of local input and access to research subjects and topics and the projects. How would CREATE–21 maintain that local

influence and ensure that stakeholders such as farmers and members of universities continue to have a voice in the direction of USDA research initiatives?

Mr. ARMSTRONG. I think it would do nothing but enhance that, Senator. I believe it would do that through an advisory board. There are some differences in what we propose as an advisory board versus the Department's. In fact, our advisory board is more in line with Dr. Danforth's proposal. But we would not alter the connections of the university or ARS at the ground level. What we are really talking about is how do we generate the ideas. Where is the planning?

Take the honeybee example. If we have a problem you have to now go to multiple people and multiple agencies. There should be one place, and then take that and work through the intramural or the competitive to solve the problem.

So it is really a subtle but a very profound change in having a single set of program leaders at the national level. I think that would enhance the ability of a producer to walk in and say here is a national program leader for soil science, and that is going to impact forestry, it is going to impact different areas. And then, of course, there are teams below that are more specific. Some may be more intramural from a delivery perspective. Some may be more competitive. And, of course, we want to grow the competitive, which all scientists can compete for these competitive programs, not just ARS or the land grant universities, but all scientists could compete for these competitive programs to get the very best scientists, the very best science.

Senator THUNE. Thank you. My time is well expired.

Thank you, Mr. Chairman. Thank you all very much.

Chairman HARKIN. Good line of questioning, though.

Dr. Thicke, I just was looking here, the response that you just said indicative concern about funding going to a few States, a few large States, if we did not have the formula funding. Dr. Leshner in his testimony pointed out that the top ten State recipients of USDA R&D funding receive 51 percent of the total share. But then he goes on to point out that the top 10 for NIH get 72 percent, and for NSF it is 61 percent. So of those three, agriculture is the best in terms of being more widely disbursed in that regard. But, still, even with the system that we have had, the top 10 States get 51 percent of the share. So I am not certain that under the present system it is being disbursed evenly either.

The other thing that Dr. Danforth pointed out that I think bears repeating is that NIH spends about $15 for research for every $1 spent by USDA. Fifteen times. The NIH awards about $150 in competitive, peer-reviewed grants for every $1 awarded by USDA. For the last 20 years, the growth in agricultural research has averaged around 1 percent compared with about 6 percent for NIH over that 20–year period of time. So what that all adds up to, I think, is—what I have heard from all of you—that regardless of how we shape and fashion this, that because of the new challenges facing us, both in food and in energy, that we are really inadequate in the amount of money we are putting into ag research. I see heads nodding. Dr. Leshner?

Mr. LESHNER. Absolutely. That is absolutely the case.

Chairman HARKIN. From the AAAS standpoint?
Mr. LESHNER. Absolutely.
Chairman HARKIN. Dr. Armstrong?
Mr. ARMSTRONG. Absolutely, Senator.
Chairman HARKIN. Dr. Danforth?
Mr. DANFORTH. Yes, sir.
Chairman HARKIN. And I assume Dr. Thicke. Well, that is interesting. You know, we look at the budgets and what we are doing here, and we are getting so much demand on agriculture. And I am just not certain that we are responding adequately enough with the amount of dollars that we have.

The only last thing I had was for Dr. Thicke, just one thing for the record here. In response to the question by Senator Chambliss and what would help you as a hands-on farmer, you said more direct contact with the researchers and things like that. Let me just change that question a little bit. Since the organic industry is growing rapidly—at least the demands on it are growing rapidly, what specific information—information, now—or research needs do you have that would help you or help other farmers transition?

A friend of mine is an organic farmer in western Iowa. He took a whole section of land and turned it into organic farming, and he grows organic corn and beans and hogs and cattle. He has done some rye and a few other different things. It is all organic. And he is doing quite well at it now.

The problem was the transition and to get to that point. And as he went looking around for research to help him, there just was not much. And here is a college graduate, his wife is a college graduate, two kids are college graduates, in the operation, but they just could not seem to find the kind of research needed, about what you do and how do you do it.

So I am just wondering if that rings true with you. Again, I would just repeat: What kind of specific information or research would someone in your situation need? Not so much the direct contact, but what is the information you need?

Mr. THICKE. Well, first of all, I think you are right about there is a lack of information for organic farmers, and for many years organic farmers were basically put off. They did not feel like extension had the information they needed. They did not know where to go. They basically got it from each other. And now extension is starting to respond, and particularly where you get people, individuals who are working in that area, it makes a big difference.

But as far as specific information, in the transition and even in ongoing organic farming, some of the big issues are weed management and insect management, especially in vegetable crops; and in animal systems, animal health management without synthetic kinds of antibiotics and such.

We tend to think, because we have a long history of many billions of dollars being put into research on antibiotics, that antibiotics are the final bottom line. But that is not the case. There are some innovative products out there by little shoestring companies that are helpful. I for example, will use for calf diarrhea these little herbal boluses that really, really work on something like that, but nobody has any idea——

Chairman HARKIN. I have no idea what you are talking about.

Mr. THICKE. I am sorry. Calf sickness for baby calves, sicknesses in—a bolus is a big pill. Sorry. And this really helps a lot to knock the disease out of the calf. It is something that we think only antibiotics can do.

But I am coming to the point that there is a lot of innovation done here and there, but it needs to be done more systematically. We need to have the scientific base to help us understand what is happening and to verify which products work and which do not work, and also what kind of a holistic systems help to prevent disease. So it is basically a holistic kind of approach.

Did that make any sense? Did I lose you?

Chairman HARKIN. I may ask my staff to interpret all that.

[Laughter.]

Chairman HARKIN. To help me a little bit on that one.

Well, listen, those were just really the things I wanted to cover with you for the record. Again, I think we are going to struggle through this on this Committee, and I assume on the House Committee, too, both from the authorizing standpoint of authorizing the amounts, but then on Ag. Approps. to try to get the amounts of money in, either mandatory or discretionary, one of the two, and then to structure itself.

As you can see, I personally have a lot of questions about the structure. I still do not understand how either your proposal or the proposal for CREATE–21 is different than what we tried in 1979 and that did not work out. Maybe it is different. I will just have to figure that out, and why this would work and the other one did not work.

But as you can tell, both Senator Chambliss and I are very interested in agricultural research, and all aspects of it, and how to strengthen it and how to use this farm bill, to position us for the next 5, 10 years and put us in the direction we should go. And to that extent, I thank all of you for your input and welcome you to continue to give us input as we deliberate on this in the coming months.

Senator Chambliss?

Senator CHAMBLISS. I would just comment, Mr. Chairman, to all four of you, as well as Dr. Buchanan, I cannot tell you how much we appreciate you, No. 1, doing the work that you are doing and thinking outside the box and trying to come up with new ways to make a good product better; and, second, for being here today to share these thoughts with us. I am a big fan, just like Senator Harkin, of research, period. Whether it is defense, medicine, or agriculture, I am firmly convinced that our children are going to live in a better world than we are, primarily because of the investment that we are making in your area today. And we just have got to continue to do that.

So I thank you for the work that you are doing out there and trying to help us formulate some long-term policy, and thanks to all of you for being here today.

Chairman HARKIN. Thank you again, and the Committee will stand adjourned. Our next meeting will be the 21st, and the subject will be trade.

[Whereupon, at 11:39 a.m., the Committee was adjourned.]

A P P E N D I X

MARCH 7, 2007

Senate Committee on Agriculture,
Nutrition, and Forestry

Senator Thad Cochran

March 7, 2006

Mr. Chairman, thank you for holding this important hearing. I welcome the panel to the Committee and thank you for your testimony.

An important aspect of the farm bill is the research title. This research is a critical part of ensuring U.S. producers remain the leaders in food and fiber production. The Agricultural Research Service and land grant institutions play a vital role in this research. In Mississippi, the Agricultural Research Service and our research universities have developed successful partnerships to help meet the many challenges facing southern agriculture.

An investment in agriculture research through the farm bill is a small sum compared to the economic benefits enjoyed by American farmers. I am concerned about the Administration's proposal to combine the Agricultural Research Service and the Cooperative State Research, Education, and Extension Service into a single agency. The Agricultural Research Service works well as an independent agency in the Department of Agriculture.

I look forward to hearing the testimony of this distinguished panel of witnesses. The research proposals they will discuss will be considered carefully by our committee.

Senator Mike Crapo
Agricultural Research Hearing
Senate Agriculture, Nutrition and Forestry Committee
March 7, 2007

Mr. Chairman, thank you for holding this hearing and for the opportunity to share a few words. Research is essential to maintain U.S. agriculture's competitiveness.

Demands on our agricultural lands, forests and natural resources are increasing as Americans call for an affordable food supply, clean air and water, enhanced wildlife habitat, open living space, and higher and more efficient production capabilities. These demands are compounded by ever emerging pests and diseases, adverse weather conditions and drought that impact livelihoods and trade markets. We can meet these challenges, and research can focus our efforts in an environmentally sustainable manner.

That is why it is essential to take a look at whether agriculture research is best enabling U.S. agriculture's competitiveness. We can all agree there have been many accomplishments through agriculture research. However, with the length of time it takes to develop responses to ever changing needs, we must anticipate needs today that may emerge years from now. This takes a substantial dedication of resources, time, ever improved coordination between USDA, stakeholder and universities, and assurance that technology developed through this research is reaching end users.

Between research components of the Administration's Farm Bill proposal, proposals represented in the testimony of the witnesses here today and others, there are a number of worthy ideas to better focus research efforts that warrant careful consideration.

I look forward to the discussion today, and thank our witnesses for being here to contribute. Thank you again for the opportunity to share my thoughts.

Statement

Senator Charles E. Grassley

Thank you Mr. Chairman for holding this hearing today on the importance of the research title.

I would like to thank the witnesses for appearing before the Committee this morning.

Iowa is a leader in the research field through many of our institutions of higher learning.

There is not a day that goes by in my office when I hold my constituent meetings that a visiting student or professor does not touch on what is going on in the area of research related to agriculture.

They touch upon issues related to renewable energy research, animal agriculture, and even research related to Iowa's growing wine industry.

I know the importance of keeping the necessary funding available for the programs that fall under research and education.

In the interest of time I will jump into some questions for a fellow Iowan Mr. Francis Thicke.

Questions for Mr. Thicke (Iowan)
Senator Grassley

1.) Mr. Thicke, After looking over your testimony I think there is a good deal of merit in your suggestions to maintain and strengthen the Initiative for Future Agriculture and Food Systems program. Is it your opinion that if this program were allowed to proceed with funding intact, what are some the high priority research issues that it could be pursuing?

2.) Given your Extension background, do you have further thoughts how Extension could help US Agriculture meet the growing consumer demand for organic food?

3.) Has the Sustainable Agriculture Research and Education (SARE) program contributed in any way to your success as a farmer? What do you hear about the program from other farmers?

Question for Gale Buchanan (USDA Witness)
Senator Grassley

1.) I was glad to see that you mentioned Foot and Mouth Disease in your testimony. As the ranking member of the Committee that oversees trade. I am a firm believer that sound science should be the basis for trade decision related to diseases.

You mention in your testimony that you will need the authorization to conduct important foreign animal disease research at the new National Bio and Agro Defense Facility. Could you please elaborate on this?

Senator Ken Salazar
Agriculture Committee Hearing
Investing in Our Nation's Future through Agricultural Research.
March 7, 2007

Statement

Chairman Harkin and Ranking Member Chambliss, thank you for holding this hearing on investment in agricultural research. I also would like to thank the witnesses for talking with us today on this important subject. I am greatly interested in your ideas and vision for rural America.

First, let me slightly digress to thank the Chairman for scheduling a field hearing next week in Brighton, Colorado. I am honored that my friend will visit the great state of Colorado, and I speak for many producers out there who are very excited for this hearing.

Rural America looks to agricultural research to ensure the long term viability and vitality of their communities. Indeed, research is the foundation on which the furtherance of agricultural science rests. The research that Colorado State University performs in Ft. Collins and Rocky Ford play a key role nationally in the fight against infectious animal disease along with plant diseases like Russian Wheat Aphid. The ARS station in Akron also performs admirably in their capacities. Without the dedication of those who work in these stations and those like them across the country, we could not fight disease, improve crop efficiency, or combat pests as effectively. It keeps our producers competitive in the world's global economy. During my own farm bill listening sessions in Colorado I met many farmers and rancher around my state who overwhelmingly support USDA-funded research programs. While many of these hardworking Coloradans have worked the land for generations and are bound to them by tradition, they recognize that the only way to sustain their way of life is to look forward. Agricultural research is inherently forward looking, and we should be consistent and steady in our support of it.

I, like many on this Committee, was pleased the Administration's farm bill proposal included a well thought-out Research Title. It was a worthy starting point for discussion. I especially appreciate the commitment the Administration has shown towards the research and development of renewable energy sources on the farm and ranch, as well as the attention it has given towards specialty crops. However, many groups that I have spoken with have expressed concerns with the Administration's ideas with regards to the consolidation of CSREES and ARS, as well as the CREATE-21 proposal. I look forward to both panels' thoughts on this matter, as any consolidation will have a profound impact on how we approach agricultural research.

We must write a research title of the Farm Bill that will revitalize rural America, making it hardier and better able to compete. I remain dedicated to this end and will continue to work my colleagues on this committee to make sure we include a robust and effective research title.

Thank you again Mr. Chairman and Mr. Ranking Member for holding this hearing. Also, I, once again, thank the witnesses for their time and expertise.

NASULGC National Association of State Universities and Land-Grant Colleges

Testimony of

Dr. Jeffrey D. Armstrong
Dean, College of Agriculture and Natural Resources
Michigan State University
and
Chair, NASULGC's Farm Bill Committee

Representing the
Board on Agriculture Assembly
National Association of State Universities and Land-Grant Colleges

before the

Committee on Agriculture, Nutrition, and Forestry
United States Senate

"Investing in Our Nation's Future through Agricultural Research"

March 7, 2007

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Mr. Chairman and members of the committee, I am pleased to appear before you this morning representing the National Association of State Universities and Land-Grant Colleges to discuss our CREATE-21 proposal for the Research Title of the Farm Bill.

As you know, NASULGC and our partners have been working diligently over the past two years to reach consensus within the land-grant community and among our external partners about how the Federal-State Partnership[1] in food, agriculture, and natural resources research, education, and extension could be updated and improved to meet the needs of the 21st Century.

The land-grant system traces its roots to the First Morrill Act of 1862, with major statutory authorities enacted in 1887, 1890, 1914, 1962, 1977, 1994, and 1997. Although we have a long history and many proud traditions, we have looked hard at how we have been doing business, listened to our critics, and embraced change.

Specifically, we have decided that future funding increases for both fundamental research and integrated activities (projects that integrate research with extension and/or education) should be distributed primarily through competitively-awarded, peer-reviewed grants. However, for reasons explained in a moment, this cannot be done by reducing the funding streams that sustain the basic capacity of U.S. Department of Agriculture (USDA) intramural research units (ARS, ERS, and Forest Service R&D), land-grant universities, state agricultural experiment stations, or cooperative extension offices. In fact, just the opposite is true; these capacity programs need greater funding too!

As chair of NASULGC's Farm Bill Committee and one of three co-chairs of NASULGC's CREATE-21 panel, I have had the opportunity to visit with federal and state decision-makers, stakeholders, and land-grant officials over the last several years. At every meeting I have fielded a variant of the same question: "How can you ask for more money at a time like this?" My answer is always the same: The challenges and opportunities we face are both prodigious and generational in scope. If we cannot put forward a plan that directly addresses the inefficiencies in the present system of small and separate agencies with dozens of funding "stovepipes" (or "silos" — to use an agricultural term) and one that demonstrates the essential value of increased funding for research, education, and extension, then we get what we deserve.

CREATE-21: A Bold and Comprehensive Plan

CREATE-21 is, as I said, the result of a deliberative process to rethink the basic structure of the Federal-State Partnership that guides, manages, and funds America's food, agriculture, and natural resources research, education, and public outreach. The acronym we've chosen stands for "Creating Research, Extension, and Teaching Excellence for the 21st Century," and we believe that ours is the only plan on the table that will truly accomplish that objective.

The CREATE-21 proposal is a direct response to the efforts over the last three years by the Office of Management and Budget (OMB) to either eliminate entirely or redirect to competitive mechanisms a portion of appropriated research funds that flow through the USDA to state agricultural experiment

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[1] The unique partnership arrangement between the Federal Government and the governments of the several States is described in Section 1409A (a) of the National Agricultural Research, Extension, and Teaching Act of 1977 (as amended).

stations, forestry schools, and veterinary medicine schools. OMB's objections stem not from the quality of the research performed — after all, these programs routinely garner high OMB program evaluation scores — but rather from the fact that the funds are distributed by statutory formulas and not competitive processes. We recognize what worked 50 years ago does not work efficiently now, much less 10 years from now. These realities have led us to today's proposal.

CREATE-21 is much more than just a response to criticism. It is a bold and comprehensive plan to: (1) bring together in a single organization the many research agencies, offices, programs, projects, personnel, and facilities currently spread across USDA; and (2) more tightly integrate this intramural research capacity with the extramural research, teaching, and extension capacity within land-grant universities and related institutions. (See Fig. 1, Page 9.)

The other fundamental purpose of CREATE-21 is to double authorized funding levels for intramural and extramural food, agricultural, and natural resource research, teaching, and extension programs at USDA. This element is included within the CREATE-21 proposal because there are dozens of critical and urgent national problems that will not be solved in an acceptable timeframe unless USDA science program levels are substantially and immediately increased.

CREATE-21: Details and Benefits

Food, agricultural, and natural resources research, extension, and education programs are spread over four USDA agencies: (1) Agriculture Research Service (ARS); (2) Cooperative State Research, Education, and Extension Service (CSREES); (3) Economic Research Service (ERS); and (4) Forest Service R&D. As a result, there is frequent programmatic duplication, no "lead-agency" to address critical national issues, and a lack of clear and simple integration across agencies.

CREATE-21 addresses the shortcomings of this situation by integrating ARS, CSREES, ERS, and Forest Service R&D (including their functions, personnel, programs, and activities) within a new organization to be called the National Institutes for Food and Agriculture (NIFA):

- NIFA will be an independent agency reporting directly to the Secretary of Agriculture and headed by a Director who is an acknowledged expert. The Director will be nominated by the President, confirmed by the Senate for a single six-year term, and guided and assisted by a Council of Advisors. (This is loosely modeled on a structure similar to those successfully employed by the National Institutes of Health (NIH) and the National Science Foundation (NSF).)
- The Director and his team will manage a broad and integrated portfolio of programs organized by problem/solution areas and will include six national institutes:

  (1) Economic Opportunities in Agriculture and Natural Resources;

  (2) Nutrition and Health;

  (3) Rural and Urban Community Development;

  (4) Natural Resources and Environment;

  (5) Food Safety and Agricultural Security; and

  (6) Families, Youth, and Communities.

- NIFA's "competitive" programs will be open to all qualified universities/investigators and will be aimed at solving problems of pressing multistate, national, or international significance.
- NIFA's "capacity" programs will maintain and expand the intramural research capabilities within USDA (e.g. ARS, ERS, and USFS R&D) and the research, extension, education, and international capabilities within land-grant universities and related institutions.
- Finally, NIFA will have special funding provisions to enhance the capacity and competitiveness of the 1890, 1994, small 1862 land-grant institutions, and related agricultural colleges.

Consolidating ARS, CSREES, ERS, and Forest Service R&D into one cohesive organization will, we believe, have many advantages:

- Program integration will be strengthened by integrating the research capacity of ARS, ERS, and Forest Service R&D and aligning these intramural resources more closely with the research, education, and extension capacity of America's land-grant universities and related institutions.
- Budgetary efficiency will be improved through elimination of duplicative programs and activities and a streamlined bureaucracy.
- Organizational flexibility will be increased through a variable structure organized around six major problem-solution areas (the six institutes listed above).
- Stakeholder participation will be enhanced through a Council of Advisors and other mechanisms for improved and increased input at all levels.

In addition to the organizational elements described above, CREATE-21 envisions increased funding (compared to current agency baselines) for NIFA's competitive and capacity programs:

- Competitive funding will (after seven years) reach $2.1 billion per year, with fundamental research constituting 55 percent of the total and integrated programs the remaining 45 percent.
- Capacity funding will (after seven years) reach $2.9 billion per year, enabling intramural USDA research and extramural programs at land-grant universities and related institutions to maintain and extend their base operations.
- If CREATE-21 is enacted and fully funded, after seven years the competitive/capacity ratio — considering existing funds ($2.7 billion) and new funds ($2.7 billion) — would be 42 percent competitive and 58 percent capacity funding. Currently, the ratio is approximately 10 percent competitive and 90 percent capacity. (See Fig. 2, Page 9.)
- However, to "jump start" the funding enhancement program, $200 million per year in mandatory funding would flow immediately to NIFA from the statutory authority for the Initiative for Future Agricultural and Food Systems (IFAFS) program.

CREATE-21: Biofuels and Bioproducts — a Paradigm Example of Need

Mr. Chairman, the land-grant community realizes that CREATE-21 is ambitious in its objectives and audacious in its scope. We have coalesced behind this proposal because we believe that neither the status quo nor halfway measures are acceptable. The status quo is not bad. It's just not as good as it

should be. And, as I will discuss later, some of the other proposals your committee may have under consideration are not bad either. They are just not as bold, integrative, and comprehensive as they ought to be. ***In fact, our proposal includes each of the other proposals!***

To illustrate why a comprehensive approach (in both organizational structure and funding) is absolutely necessary, let me present a single, detailed example of an urgent national problem area that would be better addressed if CREATE-21 were enacted. But, before I do that, let me say that although this example focuses on bioproducts (including biofuels), there are many other problem areas that could illustrate our case (such as avian influenza, human health and obesity, international competitiveness, animal health and disease, climate change, sustainable agriculture, etc.).

As members of this committee are aware, a wide variety of innovative bioproducts are currently under development. While ethanol production from corn has been highly publicized, scientists are working on hundreds of promising value-added, bio-based products including:

- soybean-based biomaterials with desirable, rubber-like properties;
- biodegradable products from corn, such as plastics, solvents and disposable foam for packaging, plates, and other uses;
- antibodies and other protein therapeutics produced in corn, tobacco, and alfalfa for the treatment of human disease;
- textiles made from corn and other plants that may be used in clothing, bedding, carpeting, and automobile interiors;
- new fluids developed from oil-seed crops that have excellent sun-protective qualities and many potential industrial uses; and
- products with unique performance characteristics, such as sturdier cotton or harder or softer wood.

In addition, more than half of the next generation of new drugs is likely to be derived from human proteins in a process that is lengthy, complex and expensive. The drug industry has no quick or economical way to get these critical drugs from the microscope to the marketplace. The answer to these problems may come from chickens. Genetically modified chickens can produce human protein in their eggs. If such a process can be made commercially viable, biological medications could be produced less expensively and in higher volume.

Innovative products such as these can provide important economic benefits to producers and bring new opportunities to small farmers. They also can serve as the basis for new regional industries in rural areas. And then there is ethanol.

The United States has a goal of producing 20 percent of its transportation fuels from biomass by 2030 and efforts to achieve that objective are well underway. However, this is a very ambitious undertaking, requiring the dedication of millions of additional acres to the production of ethanol and biodiesel; the development of entirely new methods to produce bioproducts from cellulosic materials; and the recovery of huge quantities of waste biomass from fields, farms, forests, mills, and landfills.

A recent report issued jointly by USDA and DOE (*Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply*) notes that at least five advances will be required to reach this goal:

- Yields of corn, wheat, and other small grains must be increased by 50 percent.
- Agriculture harvest techniques must be capable of recovering 75 percent of annual crop residues.
- Some 55 million acres of cropland, idle cropland, and pasture must be dedicated to perennial bioenergy crops.
- All manure in excess of that which can be applied on-farm for soil improvement must be used for biofuels, and all other available residues must be similarly utilized.
- The quantity of wood recovered from forests, processing plants, municipal solid waste, and other sources must double.

As a country, how are we going to get from here to there without negative impacts on other parts of the system? The answer lies in CREATE-21.

Last year, Senators Stabenow and Levin visited the lab of Michigan State chemical engineer Bruce Dale to learn more about renewable fuels with emphasis on cellulosic ethanol. At the end of the tour, Senator Levin said: "Professor Dale, you've told us that cellulosic ethanol isn't ready right now because the cost is too high. What is it going to take to accelerate this technology and get it to market within five to ten years versus ten years or more?" Professor Dale thought for a moment and then carefully replied. "Senator," he said, "it will take a two-pronged approach. We need about $1 billion for fundamental research and another $1 billion for an integrated, systems approach — including outreach through Extension — to help us understand and deal with the profound dynamics of this new paradigm."

This advice from Dr. Dale is consistent with the report that this committee recently received from the National Agricultural Research, Extension, Education, and Economics (NAREEE) Advisory Board. As that report makes clear, technology development and scientific progress in the bioproducts arena are neither simple nor linear. Success depends upon two critical ingredients: translational research and a systems approach. Yes, we need fundamental research into cell-level mechanisms and enzymes, but we can't stop there. We need a total systems approach that integrates traditional agricultural research, economics, and extension while considering the larger social and environmental impacts.

Let me digress for a moment. The current Federal-State Partnership has been successful in the past, but it was not built for the complicated opportunities and threats that we increasingly face. Nonetheless, bioproducts represents a tremendous opportunity for USDA and its collaborators to show that research, education, and extension can continue to contribute to economic prosperity and quality of life, which are at the very heart of the land-grant mission. But we need one, single, well-funded organization to develop programs like this and not four smaller agencies with limited budgets!

Now let me go back to Professor Dale. A few months after the senators visited his lab, I asked him this question: "If the Federal-State Partnership had put adequate funds, especially

competitive funds, in place 20-25 years ago, where would we be today?" His response was immediate and unequivocal. He indicated that we would have fuel costing less than a dollar a gallon and that other public benefits — measured in terms of rural development, farm income, and quality of life — would be equally profound.

Parenthetically, I would also add that competitive dollars invested in a systems approach that includes extension and integrative research (not just fundamental research) would deal with many of the questions of today, including agriculture's impact on the environment, fuel vs. food, and of course, the unintended impacts of grain-based ethanol on animal agriculture.

CREATE-21: The Time is Now!

The rate of change in the world accelerates daily. So, let's not look back 20 years, but forward ten years. Mr. Chairman, when your successors write the 2017 Farm Bill, what will they say? Will they wonder why you and your colleagues missed the chance to embrace the great opportunities and address the enormous problems that lie ahead, or will they thank you profusely for your foresight?

Or, to use a specific example, I know that Senator Stabenow has worked hard to educate this committee about the value of specialty crops. Ten years from now, will we have a thriving and profitable specialty crops industry in states such as Michigan, or will members of this committee be talking about how to reduce America's dependence on foreign food just as we are now talking about reducing our dependence on foreign oil?

The leadership of the land-grant system believes that USDA's food, agriculture, and natural resource science programs are at a critical juncture. Those of us who care deeply about these programs can either resist change or seize the opportunity to shape that change.

As a scientist and representative of a state with a $60 billion agricultural economy, let me use dairy — one of the fundamental components of this thriving part of Michigan's economy — to make two final points. When it comes to this industry, we have no choice but to take a systems approach, that is to consider the business in the broader context of its societal and environmental impacts. And, we have to address the questions that citizens want answered. They want to know if their milk is safe and nutritious and if it is produced in a humane manner with appropriate concern for the environment.

And my second dairy point is this: If we don't do something right now to greatly increase competitive funding for research, education, and extension, we are going to lose numerous faculty with a direct connection to agriculture.

At Michigan State, there are many dairy researchers conducting leading-edge research. If we don't change the USDA system and increase competitive funding to support them, these researchers will gravitate to different models, looking, for example to grants from NIH or NSF, which use mice and rats to model to human health. This capacity will be lost, and I contend, it will never come back. While our land-grant university will survive, without the positive changes inherent in CREATE-21, we will become more and more detached from the very people our institutions we were created to serve.

CREATE-21 Compared to the Other Leading Plans

As described above, the CREATE-21 proposal addresses both the organizational and funding issues that this committee must tackle as you craft the Research Title of the 2007 Farm Bill. The two other major proposals before you have much to recommend them, but neither represents a truly comprehensive approach. Before closing, let me take a moment to spell out where our proposal differs from the others.

Now, this is not to say the other proposals are bad. They are both sound and would serve to improve upon the system we have now, but we believe there is only one opportunity to recraft the framework of the Federal-State Partnership. We must be bold and create a structure that will lay the foundation to serve our stakeholders for the next 50 years. If we do not adjust to the new economy and environment, then we will fail in our core responsibility to provide America's farmers, ranchers, foresters, families, and children with the service, science, and education they so rightly deserve.

USDA Research, Education, and Economics Task Force (Danforth) Plan. First, on behalf of NASULGC, I want to thank Dr. Danforth for lending his tremendous credibility to this important discussion. His October 13, 2006, editorial in *Science* magazine provides a strong rationale for bolstering agricultural research. A close examination of the proposal arising from the July 2004 report of the his Task Force reveals that the major similarity to CREATE-21 is funding authorization for a new fundamental research program that will grow to $1 billion per year over a five- or seven-year period. Thus, the Danforth Plan is included within CREATE-21.

However, the Danforth proposal would only exacerbate some of the problems that are inherent in the current organizational structure at USDA (where programs are spread across numerous agencies), and it cannot, therefore, enhance the integration, efficiency, flexibility, and accountability of programmatic efforts in research, extension, and education (as CREATE-21 does). Furthermore, the proposal does not address the chronic decline in funding that is slowly eroding the intramural capacity of agencies such as ARS and Forest Service R&D and the research, teaching, and extension capacity of the land-grant system. And, finally, it does not bolster the capacity and competitive position of the minority-serving land-grant institutions, such as the historically black universities and the tribal colleges.

The USDA Plan. Unlike the Danforth proposal, the USDA plan has yet to be proffered in legislative form. However, from what we have been able to discern, the proposal does incorporate some of the key elements of CREATE-21. For example, it calls for the consolidation of CSREES and ARS into a new agency to be called the Research, Education, and Extension Service within a new USDA Office of Science. Further, it would authorize new fundamental research funding streams for biofuels and specialty crops.

It would not, however, reverse the slow but steady erosion in capacity funding at USDA and within the land-grant system. It would not include all of the key agencies/units that are included within CREATE-21. And, it would not authorize broad, new competitive programs. Thus, the proposal is not equivalent to the total systems approach that CREATE-21 provides (through bolstering research and extension capacity and an integrated competitive grants program). Finally, this proposal does not strengthen the capacity and competitive position of the minority-serving land-grant institutions.

Other Farm Bill Recommendations

Mr. Chairman, I would be remiss if I did not mention that the NASULGC's Farm Bill Committee has developed a number of other proposals to improve the operation and effectiveness of several other Farm Bill programs and authorities beyond CREATE-21 and the Research Title. These include suggestions to further enhance the contributions that our research, education, and extension programs make through the Farm Bill's energy, conservation, nutrition, rural development, trade, and other titles. We would be pleased to share these proposals with the Committee at your earliest convenience.

Conclusion

On behalf of the Board on Agriculture Assembly of the National Association of State Universities and Land-Grant Colleges let me thank you for the opportunity to present this testimony. We look forward to working closely with you in the months ahead to craft a Research Title to the 2007 Farm Bill that seizes the opportunity to update and improve both the structure of the USDA science apparatus and the mechanisms by which the Federal-State Partnership funds food, agricultural, and natural resources research, teaching, and extension.

# # #

For More Information: WWW.CREATE-21.ORG

Figure 1:

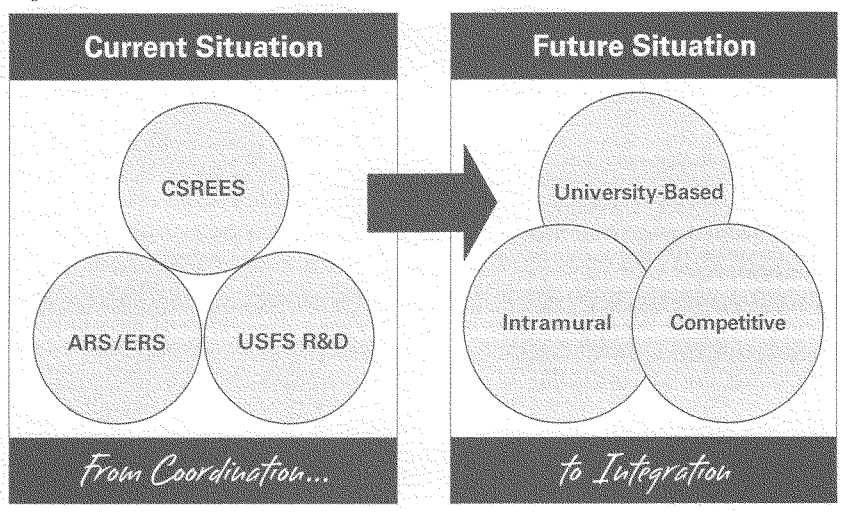
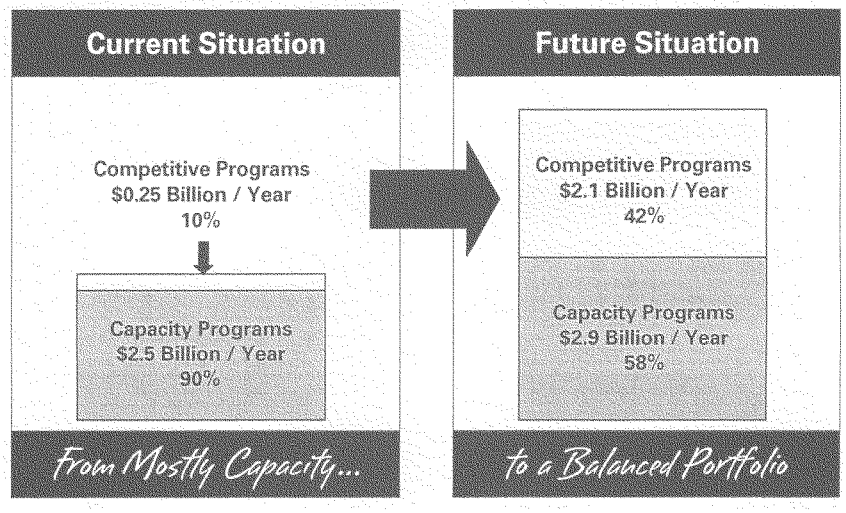


Figure 2:



STATEMENT OF DR. GALE BUCHANAN
UNDER SECRETARY FOR RESEARCH, EDUCATION & ECONOMICS
UNITED STATES DEPARTMENT OF AGRICULTURE

BEFORE THE
U.S. SENATE AGRICULTURE, NUTRITION AND FORESTRY COMMITTEE

FULL COMMITTEE HEARING
"INVESTING IN OUR NATION'S FUTURE THROUGH AGRICULTURAL RESEARCH"
328-A RUSSELL SENATE OFFICE BUILDING
WASHINGTON, DC

MARCH 7, 2007

Chairman Harkin, Ranking Member Chambliss and distinguished members of the Committee, it is a great pleasure to be here this morning to discuss the United States Department of Agriculture's (USDA) research, extension and education programs and the Administration's 2007 Farm Bill proposals. I appreciate the committee's interest in these programs that are so critical to our nation's future.

The success of American agriculture is attributable, in large part, to advances in science and technology transfer generated by the USDA's research, extension, and education agencies, in partnership with the nation's Land Grant Universities and other cooperators. Science has served as a vitally important foundation for our nation's agriculture system and its ability to provide this nation and the world with its needs for food, fiber and feed.

While there has been excellent success in the past we must look to not only immediate scientific needs, but build an even stronger foundation to maintain our world leadership in agriculture. This is imperative if this nation's agriculture system is to continue as a world leader and not be severely crippled by the ever increasing disease threats, changing world market competition, and drought and other natural impacts. For example, there is an immediate and long term need for scientific answers on how our agriculture system can play an important role in meeting our nation's need for greater energy independence. The Administration's Title VII 2007 Farm Bill proposals provide organizational changes and specific funding to help meet the immediate and long term scientific needs of our agriculture system.

As Under Secretary for Research, Education and Economics, I am responsible for four agencies charged with advancing science in agriculture, the Agricultural Research Service (ARS), the Cooperative State Research, Education and Extension Service (CSREES), the Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS).

ARS is USDA's principal in-house research agency with over 2000 scientists at over 100 locations around the nation and in four foreign countries. The mission of ARS is to conduct research to develop and transfer solutions to agricultural problems of high

national priority and provide information access and dissemination to: ensure high-quality, safe food, and other agricultural products; assess the nutritional needs of Americans; sustain a competitive agricultural economy; enhance the natural resource base and the environment; and provide economic opportunities for rural citizens, communities, and society as a whole.

CSREES' unique mission is to advance knowledge for agriculture, the environment, human health and well-being, and communities by supporting research, education, and extension programs in the Land-Grant University System and other partner organizations. CSREES doesn't perform actual research, education, and extension functions but rather helps fund it at the state and local level and provides programmatic leadership in these areas.

ERS is a primary source of economic information and research in the U.S. Department of Agriculture. With 450 employees, ERS conducts a research program to inform public and private decision-making on economic and policy issues involving food, farming, natural resources, and rural development.

NASS is the Department's primary statistical agency and provides official USDA crop and livestock production, economic, and environmental data on agriculture and rural America. NASS conducts hundreds of surveys every year and prepares reports covering virtually every aspect of U.S. agriculture including: production and supplies of food and fiber, prices paid and received by farmers, farm labor and wages, farm finances, chemical use, and changes in the demographics of U.S. producers. NASS is also responsible for the Census of Agriculture.

USDA is continually striving to further enhance its science-based programs for the betterment of American agriculture. The Administration's Farm Bill proposals fully recognize this fact and places a high priority on strengthening our system.

We heard from the American public through the Farm Bill Forums led by Secretary Johanns that research was a major theme in all of the sessions.

From Indiana, we heard during a USDA listening session, "...we get the highest return on investment on those dollars as about any money that's going to be spent in the farm bill. And that allows us to be low-cost producers of a safe and reliable food and fiber source." And, from Delaware we heard, "It's imperative that the next farm bill will provide support for continuing research and education. The future of American agriculture will depend on it. Technological advances in agriculture will help the next generation of American farmers."

Several speakers mentioned that the Department's dual research structure of ARS/Land Grant Universities has strengths and weaknesses. The intellectual and political challenges these institutions face have never been more numerous or challenging. Others stressed the need for more coordination of USDA's overall research funding strategy.

The Administration's farm bill proposals provide an opportunity to address these issues and to improve the efficiency of the research, extension, and education programs in the Department. Specifically, the Administration is recommending the following proposals for the 2007 Farm Bill:

1. Consolidate USDA's Agricultural Research Service (ARS) and the Cooperative State Research, Education, and Extension Service into a single agency named the Research, Education, and Extension Service (REES) which will coordinate both intramural and extramural research, extension, and education programs.
2. Rename the Research, Education, and Economics (REE) mission area to the Office of Science.
3. Establish a $50 million annually ($500 million over 10 years) mandatory funded Agricultural Bio-Energy and Bio-Based Products Research Initiative.
4. Establish a $100 million annually ($1 billion over 10 years) mandatory funded Specialty Crop Research Initiative to provide science-based tools for the specialty crop industry.
5. Authorize USDA to conduct research and diagnostics for highly infectious foreign animal diseases on mainland locations in the United States.
6. Invest an additional $10 million in mandatory funding for organic research.

I will now provide some additional information on each of these proposals.

REORGANIZATION:

All organizations can be strengthened, and we have a responsibility to strive continuously to improve the efficiency and effectiveness of our programs. In view of these principles, the Administration is recommending the reorganization and revitalization of USDA's research, education, and economics mission area.

The Administration proposes the creation of the Research, Education, and Extension Service (REES) through the merger of USDA's Agricultural Research Service (ARS) and the Cooperative State Research, Education, and Extension Service (CSREES). This new agency would be under the leadership of a Chief Scientist.

All current formula funding authorities as well as authorities for 1890, 1994 and Hispanic Serving Institutions would be retained. This integration of programs will provide better coordination and allow for enhanced efficiency and effectiveness of program implementation and resource allocation. Duplication of efforts between intramural and extramural programs would be minimized, while better identifying and utilizing comparative strengths of USDA's in-house capacity as well as USDA's university partners and other stakeholders.

In addition, the Research, Education, and Economics (REE) mission would be renamed the "USDA Office of Science." Leadership would continue under an Under Secretary and Deputy Under Secretary, who would be responsible for the new REES agency, as well as ERS and NASS. This name change will better reflect the foundation of our

programs, which is science. This nomenclature is also consistent with other Departments with major science programs, such as the Department of Energy (DOE).

AGRICULTURAL BIOENERGY AND BIOBASED PRODUCTS RESEARCH INTIATIVE

President Bush has provided strong guidance and leadership in our nation's commitment to achieving greater energy independence. In his State of the Union speech this year, the President announced a bold initiative to reduce gasoline consumption by 20% over the next 10 years and replace it with renewable fuels. The President stated that this could be done by stimulating growth of ethanol and other alternative fuels as well as increasing fuel efficiency.

The Administration's Farm Bill proposal provides $50 million in annual mandatory spending over a ten year period for the creation of the Agricultural Bio-Energy and Bio-Based Products Research Initiative to enhance the production and conversion of biomass to renewable fuels and bioproducts. These funds will support a USDA bio-energy and bio-based product laboratory network utilizing existing USDA research facilities as well as engaging the nation's land grant and other universities through a competitive process and connecting them to the laboratory network.

The new initiative will focus research and development efforts on two objectives: 1) improving biomass production and sustainability and 2) improving biomass conversion in biorefineries. Through this initiative we will be better able to take full advantage of USDA's internal and external research programs together with the network of extensive knowledge and capabilities that reside within the Land Grant universities and other research institutions throughout the United States. These activities will be closely coordinated with the Department of Energy (DOE), and its national laboratories and centers of excellence and other components of the Federal government.

American agriculture has been highly successful in capturing the sun's energy and supplying our nation with an abundant food and fiber supply. Through increased research and technology, we can continue this record of success and move our nation toward greater energy independence.

SPECIALTY CROPS

The Administration is also recommending the establishment of a Specialty Crop Research Initiative supported by $100 million in annual mandatory funding over a ten year period to provide science-based tools for the specialty crop industry.

Fruits, vegetable, horticultural plants, and other specialty crops are essential to healthy diets and the economic viability of American agriculture. However, specialty crop producers face unique challenges including pests and diseases; harvesting and processing issues; domestic cost pressures (including labor issues); and the uncertainty of

international markets. Enhanced research, extension, and education programs are needed to help the specialty crop industry address these challenges.

During the Farm Bill listening sessions we repeatedly heard the call for an increased investment in research for specialty crops. For example, Charles from Georgia noted that "federal investment in agricultural research dedicated to the economic vitality and long-term viability of United States specialty crops has been extremely limited." "Federal investments in research for specialty crop production, processing, marketing and consumption which influence public access to these vital commodities must be re-emphasized in the next farm bill."

And Tom, at the California forum, stated: "Specialty crops are vital to the health and well-being of all Americans, and increased consumption of specialty crops will provide tremendous health and economic benefits to both consumers and growers." "The next Farm Bill must address specialty crop issues much more effectively than in the past Farm Bills." "Policy areas that the next Farm Bill must address, with respect to the unique needs of specialty crop growers, include the following: specialty crop block grants, international trade, nutrition, marketing, invasive pest and disease issues, research, competitive grants, and conservation programs."

In addition to input from commodity and trade groups, the National Agricultural Research, Education, Extension and Economics (NAREEE) Advisory Board has identified specialty crops as a high priority and a unique opportunity to strengthen American agriculture.

Funding recommended in the Administration's proposal will provide for the creation of a Specialty Crops Research Initiative to address critical needs throughout the specialty crops industry in all regions of the U.S. Some of the specific issues to be addressed include: plant breeding, genetics, genomics, food safety and quality, production efficiency, and mechanization.

FOREIGN ANIMAL DISEASE RESEARCH

Research and diagnostics for highly infectious foreign animal disease agents, such as Foot and Mouth Disease (FMD) and Rinderpest viruses, are currently confined to an off shore location, presently the Plum Island Animal Disease Center (PIADC). The Department of Homeland Security (DHS) has initiated a process to move all the functions of PIADC to a new facility to be named the National Bio and Agro Defense Facility (NBAF). In anticipation that this facility will be built on the U.S. mainland, USDA must be authorized to conduct important foreign animal disease research on FMD and other select diseases at the new facility.

Research, diagnostics and training as well as vaccine development and evaluation are critical components to fighting and mitigating the effects of these diseases and securing the U.S. food and agricultural system. Without this research, U.S. farmers and our entire food system would be at greater risk.

The Administration proposes specific authorization for USDA to conduct research and diagnostics for highly infectious disease agents, such as FMD and Rinderpest on the U.S. mainland.

ORGANIC RESEARCH

The Administration's 2007 Farm Bill proposal also includes $10 million in mandatory funding to be available until expended for organic research. This new funding would focus on conservation and environmental outcomes and new and improved seed varieties especially suited for organic agriculture. This initiative will provide new technologies to help solve some of the unique challenges facing this growing segment of the agriculture industry.

Thank you again for the opportunity to testify before the Committee regarding the Administration's Farm Bill proposals to strengthen the nation's agricultural research, extension and education programs. I look forward to responding to your questions.

Dr. William H. Danforth

Chancellor Emeritus, Washington University in St. Louis

Chairman of the Board, Donald Danforth Plant Science Center, St. Louis Missouri

Written Statement for the Record

Before the

United States Senate Committee on Agriculture, Nutrition and Forestry

March 7, 2007

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Chairman Harkin, Ranking Member Chambliss and Members of the Committee thank you for the opportunity to testify today on such a vital topic--- the future of agriculture research. I am William Danforth, former chancellor of Washington University and now chair of the board of the Donald Danforth Plant Science Center both in St. Louis, Missouri. I have been involved in biomedical research for over fifty years and in plant science for the last dozen years.

I believe that, despite its enormous potential, agricultural research is today under appreciated, under funded, and not managed to make best use of the nation's scientific talent. We know what needs to be done to correct this problem. For over thirty years at least five separate scientific panels have argued for more competitive, merit-based grants, but traditions are hard to change and their recommendations have mostly been ignored.[1]

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[1] The five reports, all produced by the National Academy of Sciences (NAS), are: 1) Report of the Committee on Research Advisory to the U.S. Department of Agriculture (1972); 2) Investing in Research: A Proposal to Strengthen the Agricultural, Food and Environmental System (1989); 3) National Research Initiative (2000); 4) Publicly Funded Agricultural Research and the Changing Structure of U.S. Agriculture (2002); and 5) Frontiers in Agriculture Research: Food, Health, Environment, and Communities (2003). The article, "The Agricultural Grants Program," (1981) was published in the journal Science.

Thanks to Chairman Harkin, Senators Bond and Lugar among others, I was asked to chair a task force to conduct a review of agriculture research and evaluate the merits of establishing one or more National Institutes focused on the disciplines important to the progress of food and agriculture science. I ask that this task force report be included in the record of today's hearing. The final recommendations of the task force are embodied in the National Institute for Food and Agriculture Act introduced last year by Chairman Harkin, Senator Bond, Senator Lugar, Senator Coleman and others. In the House, similar legislation was introduced by Chairman Peterson.

The task force conclusions were:

1. Continued agricultural innovations are essential
    a. Past innovations growing out of agricultural research and education have given us food that is plentiful, cheap and safe. The Green Revolution by tripling production per acre has stopped Asian famines and saved the world from environmental disaster.
    b. Innovations must continue, for we face serious challenges, including
        i. Keeping American farmers successful in the face of international competition, thereby ensuring the profit growth of America's farmers and ranchers.
        ii. Developing cost effective bio-energy,
        iii. Conserving water by increasing drought resistance in plants,
        iv. Improving human nutrition,
        v. Countering the epidemic of obesity,
        vi. Strengthening food safety,
        vii. Protecting the environment,
        viii. Preventing the spread of diseases among animals and from animals to humans.

2. Modern research into the fundamental nature of farm animals and plants is an essential part of meeting these challenges. Fortunately the tools are there. New

understandings and technologies from cell biology, molecular biology and genetics are as applicable to plants and farm animals as they are to human cancers.

   a. Advances in fundamental understanding have already fortified crop protection through insect and drought resistance as well as significant contributions to healthier, more productive animals.
   b. The future is very promising.

3. America already knows how to mange and fund fundamental research. The National Institutes of Health (NIH) and the National Science Foundation (NSF) have long managed fundamental research that has practical benefits. They just invite scientists to submit competitive proposals to meet national priorities. Grants are awarded to the best proposals as judged by the confluence of scientific merit and national need.
   a. Thus, the NIH and the NSF have learned to blend political with scientific decision-making to achieve the best outcomes.
   b. This system that works in practice is in keeping with the American tradition of competitive free markets.

4. Agricultural research needs more money. It has long been badly under funded, especially considering its great national importance.
   a. The NIH spends almost $15 for research for every $1 spent by the USDA. The NIH awards about $150 in competitive, peer reviewed grants for every $1 so awarded by the USDA.
   b. For the last twenty years the growth in agricultural research has averaged around one percent compared with six percent for the NIH.
   c. Grants are smaller, of shorter duration and carry lower overhead than do those from NIH and NSF. They are, therefore, less attractive to scientists and to administrators of scientific institutions. Thus, scientists with agricultural interests are tempted to go to NIH or NSF, perhaps being less focused on agricultural problems.

d. Critical reports of scientific panels that have called for more peer-reviewed competition have been largely ignored. Consequently federal policy makers are less confident that USDA research money will be well spent. This fact may help account for the chronic under-funding.

5. Changes in the traditional management of fundamental agricultural research are now necessary. When agricultural research was young, intelligent lay people understood such things as contour plowing, irrigation, improved seeds, etc. Moreover needs of Florida were different from those of Minnesota and those of Iowa. Thus it made sense for funding decisions to be argued out in the political arena. Now, however, the intelligent lay person cannot judge the quality of research in modern genetics, molecular biology, proteomics, etc. One needs to bring in scientists to help as does the NIH and the NSF.

6. Our proposals for the National Institute for Food and Agriculture are narrow and focused.
   a. They are designed to expand and enhance USDA's fundamental agriculture research that is so necessary to future down-stream research.
   b. The fact that fundamental agricultural research can be done anywhere and is not tied to any region of the country led us to hope that greater reliance on scientific decision making about the quality and importance of research projects might be acceptable.
   c. The National Institute for Food and Agriculture Act does *not touch* existing research authorities. Rather it separated the new area so it might develop its own scientific culture. It is independent and additive. Our charge did not include considering larger restructuring nor were we competent to do so.
   d. We recommended new money that would not compete with the ongoing programs for which we have respect. Furthermore, I believe mandatory money is essential because fundamental research is the foundation seed for future generations of American agriculture. To every extent possible we

must be vanguards of research funding to shield it from changing economic conditions and budget whims. Recognizing that resources are tight the task force still emphasized the importance of the research and underscored its chronic under funding. The recommended funding amount for the first year operation of the proposed institute would be approximately 0.2 percent of the USDA budget.

7. Finally, the challenges are too great to delay any longer. If nothing is done in this time of global competition, America will continue to lose its competitive edge to cheaper land and low cost labor, nor will we capitalize optimally on our opportunities for bio-energy, or to protect our health and environment in a changing world. A parallel could be drawn using U.S. Energy Policy where until recently we failed to act for thirty years. If we do not act to enhance agricultural research now, our cost of production will continue to rise, our environmental quality will suffer and future farm program spending will escalate.

8. Therefore, Mr. Chairman, we strongly recommend the adoption of the National Institute for Food and Agriculture Act in the Research title of the 2007 Farm Bill. This legislation has enjoyed the support of several key agriculture groups including the American Soybean Association, the National Pork Producers Council, the National Farmers Union, the National Corn Growers Association and the National Chicken Council among many others. This small but critical investment on fundamental agriculture research will reap significant returns for farmers and ranchers and achieve solutions to many problems our society will confront in the decades ahead.

Testimony before the
Committee on Agriculture, Nutrition and Forestry
United States Senate
by
Alan I. Leshner, Ph.D.
Chief Executive Officer
American Association for the Advancement of Science
Executive Publisher, *Science*
March 7, 2007

Good morning, Mr. Chairman, Senator Chambliss and members of the Committee. Thank you for this opportunity to testify before you today on investing in our Nation's future through agricultural research.

The American Association for the Advancement of Science (AAAS) is the world's largest multidisciplinary scientific society and publisher of the journal, *Science*. AAAS was founded in 1848, and includes some 262 affiliated societies and academies of science, representing 10 million individuals.

A portion of my testimony builds upon data and information from the AAAS R&D Budget and Policy Program, which for more than 30 years has strived to be a comprehensive, reliable, and impartial source of information on the federal investment in research and development (www.aaas.org/spp/rd).

U.S. Research Program

By any measure, the American scientific enterprise is certainly among the best, if not *the* best in the world. Its eminence derives both from the strong support science receives from many sectors of society and from the breadth of the U.S. research and development (R&D) portfolio. The need for strong support across all scientific fields is the result both of the increasing interdependence of engineering, physical, biological, agricultural, behavioral, and social sciences, and from the importance of all these fields to innovation and the growth of the economy, as well as to the improvement of the health and quality of life of all Americans.

America's scientific leadership also is a product of a multi-faceted system for both supporting and conducting research. Substantial research support comes from a broad array of Federal government agencies, private philanthropic foundations, from industry, colleges and universities, and the states. The proportion of support among these sources differs by field and

intent of the research, but the participation of **all** has been essential to our country's scientific successes. Moreover, much research is conducted under grants or contracts at individual laboratories located at colleges, universities, research institutes and industrial settings throughout the United States, whereas other research is conducted intramurally within government agencies, in their dedicated laboratories and contractors. Again, the success of American science has been a result of the diversity within our scientific system.

The keystone of U.S. science has been the awarding of research support on the basis of what is called peer or merit review. The award of research grants through merit review goes back over a hundred years. The Smithsonian Institution created a scientific advisory committee in the mid-19th Century to review proposals for merit before awarding funds. This practice was later embraced by the U.S. Navy and the predecessor to the National Institutes of Health (NIH) in the early 20th Century. Peer-reviewed, merit evaluation allows the government and other funders to prioritize resources and at the same time ensure that the best ideas with the maximum potential will be funded, based on the judgments of top U.S. scientists.

America's innovative scientific spirit, combined with this unique system for supporting and conducting science, has brought us innovations as diverse as the Internet, magnetic resonance imaging (MRI), and satellite-based weather forecasting. In agricultural research, the return on investment has meant higher productivity and lower prices for consumers, improved land management practices, and enhancements in food safety and quality. Perhaps most importantly, the federal government's role in agricultural research has ensured a critical investment in science education through its historical relationship with our nation's land-grant institutions.

Comparison of Key R&D Agencies

Most of the federal government's R&D is mission-oriented: that is, it is intended to serve the goals and objectives of the agency that provides the funds (e.g., agricultural research in the USDA; health research at NIH). As mentioned before, many of these agencies include in-house research labs and centers (e.g., EPA) in addition to supporting research performed at our nation's universities and colleges, by the private sector, and at Federally Funded Research and Development Centers (FFRDCs).

The National Science Foundation (NSF), however, is unique among the mission-oriented agencies. Its primary mission is to support basic and applied research, research facilities, and education across a wide range of science and engineering disciplines. NSF, without laboratories of its own, supports competitive, merit-evaluated research at extramural institutions. More than 80 percent of NSF's $4.8 billion research budget goes to universities and colleges across the United States (see Chart 1).

The National Institutes of Health (NIH), on the other hand, has a research portfolio that mixes both intramural and extramural research as does the USDA. Of the $28.6 billion in R&D that NIH received in FY 2007, approximately 20 percent went to support intramural research conducted at the NIH institutes (see NIH performer chart). Approximately 80 percent of the NIH budget goes to support extramural research, the majority of which is distributed to external performers through Research Project Grants (RPGs), which are investigator initiated, peer reviewed, and competitively awarded. Universities receive 56 percent of all NIH R&D funds (see Chart 2).

In contrast to NIH, almost 73 percent of USDA's R&D budget goes to support intramural research and 27 percent goes to academic research (see Chart 3).

Agricultural Research in the FY 2008 Budget

Under the proposed FY 2008 budget, USDA's R&D budget would fall 10.8 percent from its 2007 final appropriation to $2.0 billion, mostly from proposed cuts in intramural research. On the extramural side, the National Research Initiative (NRI) of competitively awarded research grants would increase $66 million to $257 million. Although the NRI is authorized at $500 million and the Administration has proposed increases to the USDA's main competitive program over the years, the requests have not made it through Congress and the NRI has rarely exceeded $180 million a year in final appropriations.

Hatch Act funding would fall from an unexpectedly large $323 million 2007 appropriation down below historical levels to $164 million in the President's FY 2008 request; although funding is traditionally distributed by formula, a quarter of the 2008 funds could be awarded competitively.

USDA's intramural research conducted at the 100 Agricultural Research Service (ARS) labs throughout the country would drop in the proposed FY 2008 budget by 9.3 percent to $1.042 billion.

USDA R&D has declined significantly in recent years. Much of the big boost in the early 2000s (see Chart 4) was due not to increases in the actual conduct of research but to strengthening security requirements at USDA labs that conduct research on dangerous pathogens (e.g., anthrax).

Constraints on the Scientific Enterprise

American scientists have a virtually unlimited pool of creative ideas. The biggest constraint on scientific progress is the lack of sufficient resources needed to support research. Unfortunately, overall federal research funding is decreasing in absolute terms. The competition for federal funding is fierce, regardless of the composition of any given agency's research portfolio. NSF, for example, funded less than 25 percent of the proposals it received in FY 2006. In FY 2005, close to $1.8 billion worth of proposals that rated in the very good to excellent range were declined. NIH, meanwhile, funds approximately 20 percent of the extramural research proposals submitted (in FY 2005, it received over 32,000 proposals). It should be noted, however, that during the doubling years NIH was able to fund one in three grant applications. USDA, on the other hand, received 2,312 applications to NRI in FY 2006, representing almost $895 million worth of proposals. Of the proposals submitted, USDA funded only about 16 percent. As a result, in USDA and throughout the government, a large number of proposals worthy of funding are declined each year. In the aggregate, this represents a rich portfolio of lost research and education opportunities.

There also is some concern in the science and engineering community that the research capacity to compete for R&D dollars is highly concentrated among the top elite academic institutions. While almost 800 universities and colleges receive federal funding for research from one of the many R&D agencies, more than three-quarters of the total R&D funds go to the top 100 institutions. The government has addressed this distributional issue in part by creating a range of programs to help develop research capabilities among institutions in states that receive the least federal dollars, including the Experimental Program to Stimulate Competitive Research

(EPSCoR) program in several agencies including USDA and NSF, and the Institutional Development Award (IDEA) program at NIH.

Because USDA laboratories and land-grant universities are located in every state, USDA R&D is somewhat more evenly distributed than that of other R&D agencies and over the department's long history, it has helped to build research capacity throughout the nation to perform research to meet local agricultural needs. The top 10 state recipients of USDA R&D funding receive 51 percent of the total share; the top 10 for NIH get 72 percent, and for NSF it is 61 percent of the total share.

Conclusion

It is widely recognized that the U.S. economy, now and in the future, will depend on our ability to innovate. Maintaining the U.S. lead in innovation in turn relies on a strong foundation of federal investment in research and education across a broad spectrum of disciplines.

Robust research funding is necessary to gain the data needed to understand and craft solutions to pressing issues, ranging from a greater understanding of how to adapt to a changing climate, to the development of national security tools to protect against emerging biological and agricultural threats to our nation, to ensuring a sustainable agricultural economy for generations to come.

In an increasingly technology-based economy that relies on federally funded research as the seed corn for technology-based innovation, the federal government needs a sustained commitment to a robust and diverse research portfolio that recognizes the interdependence and critical role of all scientific disciplines to a future innovative society.

APPENDIX A

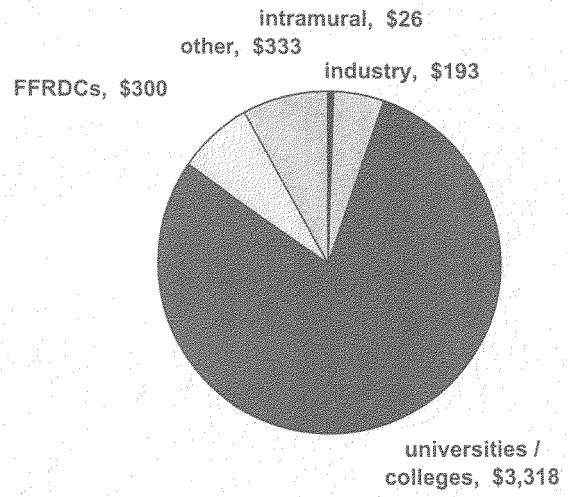
American Association for the Advancement of Science (AAAS)

The American Association for the Advancement of Science (AAAS) is the world's largest multidisciplinary scientific society and publisher of the journal, *Science* (www.sciencemag.org). AAAS (triple A-S) was founded in 1848, and includes some 262 affiliated societies and academies of science, representing 10 million individuals. *Science* has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of over one million. The non-profit AAAS (www.aaas.org) is open to all and fulfills its mission to "advance science and serve society" through initiatives in science education, science policy, international programs, and an array of activities designed both to increase public understanding and engage the public more with science.

Every year since 1976, AAAS has published an annual report analyzing research and development (R&D) in the proposed federal budget in order to make available to the scientific and engineering communities and to policymakers timely and objective information about the Administration's plans for the coming fiscal year. At the end of each congressional session, AAAS also publishes a report reviewing the impact of appropriations decisions on research and development. AAAS has also established a Web site for R&D data on which we now post regular updates on budget proposals, agency appropriations, and outyear projections for R&D, as well as numerous tables and charts. The address for the site is www.aaas.org/spp/rd.

NSF Funding of R&D, by Performer

(FY 2006 preliminary obligations in millions of dollars)



Total NSF R&D: $4.2 billion

(includes conduct of R&D and R&D facilities)

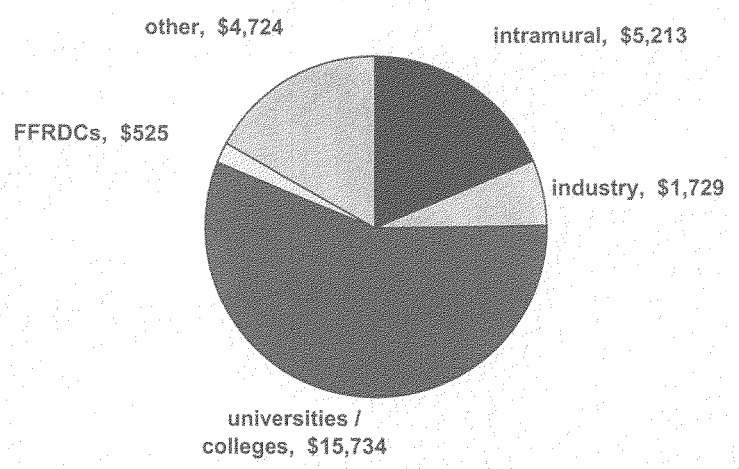
FFRDCs - federally funded research and development centers.

Source: National Science Foundation, *Federal Funds for Research and Development FY 2004, 2005, 2006,* 2006.

AAAS

NIH Funding of R&D, by Performer

(FY 2006 preliminary obligations in millions of dollars)



Total NIH R&D: $27.9 billion

(includes conduct of R&D and R&D facilities)

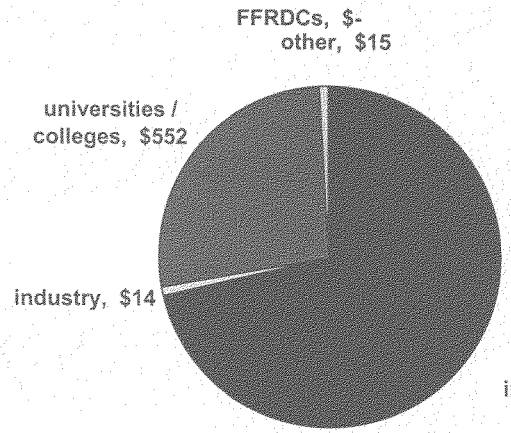
FFRDCs - federally funded research and development centers.

Source: National Science Foundation, *Federal Funds for Research and Development FY 2004, 2005, 2006,* 2006.

AAAS

USDA Funding of R&D, by Performer

(FY 2006 preliminary obligations in millions of dollars)



Total USDA R&D: $2.0 billion

(includes conduct of R&D and R&D facilities)

FFRDCs - federally funded research and development centers.

Source: National Science Foundation, *Federal Funds for Research and Development FY 2004, 2005, 2006,* 2006.

AAAS

Trends in USDA R&D, FY 1990-2008 *
in millions of constant FY 2007 dollars
ARS
All Other
Forest Service
CSREES
2500
2000
1500
1000
500
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
Source: AAAS analyses of R&D in AAAS Reports VIII-XXXII. * - FY 2008 figures are President's request. 2007 figures are latest estimates of 2007 appropriations. R&D includes conduct of R&D and R&D facilities.
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AAAS

ALAN I. LESHNER

Chief Executive Officer

American Association for the Advancement of Science

and

Executive Publisher, Science

Dr. Leshner has been Chief Executive Officer of the American Association for the Advancement of Science and Executive Publisher of the journal *Science* since December 2001. AAAS was founded in 1848 and is the world's largest, multi-disciplinary scientific and engineering society.

Before coming to AAAS, Dr. Leshner was Director of the National Institute on Drug Abuse (NIDA) from 1994-2001. One of the scientific institutes of the U.S. National Institutes of Health, NIDA supports over 85% of the world's research on the health aspects of drug abuse and addiction.

Before becoming Director of NIDA, Dr. Leshner had been the Deputy Director and Acting Director of the National Institute of Mental Health. He went to NIMH from the National Science Foundation (NSF), where he held a variety of senior positions, focusing on basic research in the biological, behavioral and social sciences, science policy and science education.

Dr. Leshner went to NSF after 10 years at Bucknell University, where he was Professor of Psychology. He has also held long-term appointments at the Postgraduate Medical School in Budapest, Hungary; at the Wisconsin Regional Primate Research Center; and as a Fulbright Scholar at the Weizmann Institute of Science in Israel. Dr. Leshner is the author of a major textbook on the relationship between hormones and behavior, and has published over 150 papers for both the scientific and lay communities on the biology of behavior, science and technology policy, science education, and public engagement with science.

Dr. Leshner received an undergraduate degree in psychology from Franklin and Marshall College, and M.S. and Ph.D. degrees in physiological psychology from Rutgers University. He also holds honorary Doctor of Science degrees from Franklin and Marshall College and the Pavlov Medical University in St. Petersburg, Russia. Dr. Leshner is an elected fellow of AAAS, the National Academy of Public Administration, the American Academy of Arts and Sciences, and many other professional societies. He is a member (and on the governing Council) of the Institute of Medicine of the National Academies of Science. The U.S. President appointed Dr. Leshner to the National Science Board in 2004. He is a member of the Advisory Committee to the Director of NIH, and represents AAAS on the U.S. Commission for UNESCO.

STATEMENT OF
FRANCIS THICKE
to the
U.S. SENATE COMMITTEE ON AGRICULTURE,
NUTRITION AND FORESTRY
at the hearing on
Investing in Our Nation's Future through Agricultural Research
March 7, 2007

Good morning Mr. Chairman and Members of the Committee. Thank you for this opportunity to testify on agricultural research, education and extension investments and the 2007 Farm Bill. My name is Francis Thicke and I am a farmer from Fairfield in Southeast Iowa. My wife, Susan, and I own and operate an organic, grass-based dairy farm where we process our milk on the farm and market fluid milk, yogurt and cheese through local grocery stores and restaurants. The rotational grazing based farm is managed organically to improve soil life as well as plant and livestock diversity.

I hold an MS in soil science from the University of Minnesota and a PhD in agronomy from the University of Illinois and worked in Washington D.C. as the National Program Leader for soil science for the USDA-Extension Service before moving to Iowa to start the dairy farm. In addition, I have worked with the Midwest Organic and Sustainable Education Service, the Scientific Congress on Organic Agriculture Research, and the Iowa Food Policy Council. I am currently a member of the USDA's NRCS State Technical Committee for Iowa and the Iowa Environmental Protection Commission. I am a member of Practical Farmers of Iowa and serve on the Board of the Organic Farming Research Foundation. I was in Washington just a week ago as a reviewer on the technical review committee for USDA's Integrated Organic research program.

The research title of the farm bill is no doubt not the most talked about subject when Congress turns its attention to the renewal of basic farm legislation. But it is our research policies and our investment in research, education and extension programs that perhaps most profoundly, over the long term, help determine what kinds of farms and rural communities we will have in the future. If we want thriving, widely dispersed family farms and vibrant farm communities, research policy needs to explicitly serve that objective. Research policies and investments also help determine whether we solve today's pressing agro-environmental and rural economic problems or whether we fail to do so. Research policies and investments help determine whether we can create a sustainable system of agriculturally-based energy production and conservation, or whether our energy needs will lead to destructive agricultural practices. Research policies and investments help determine whether revitalized local and regional food systems that promote healthy farms, healthy food, and healthy communities will take hold or grow.

No doubt everyone testifying today agrees that food, agricultural and rural research must be placed much higher on the national agenda and that long-stagnated federal funding levels need a major shot in the arm. The rate of return to publicly supported agricultural research is very high. If publicly supported research aligns itself with high ranking and widely supported public benefits – nutritional needs, environmental enhancement, new and increased farming

opportunities, a growing rural economy and improving quality of life, contributions to slowing global warming, and so on – the future for increased public investment could be bright. In that light, I would like to address several key issues for the coming farm bill.

Initiative for Future Agriculture and Food Systems

The Agricultural Research, Extension and Education Reform Act of 1998 provided the USDA's Cooperative State Research Education and Extension Service (CSREES) with mandatory spending authority of $120 million a year for five years to establish an Initiative for Future Agriculture and Food Systems (IFAFS). IFAFS provided competitive grants to address numerous current and emerging farm and food issues, with a focus on family farm and ranch profitability, environmental performance of farming systems and natural resource management, and improvements in future food production systems including food safety, technology and human nutrition. Congress placed special emphasis on research to improve the viability and competitiveness of small- and medium-sized dairy, livestock, crop and other commodity operations. The 2002 Farm Bill increased IFAFS mandatory funding levels to $200 million and added rural economic and community development to the list of IFAFS program emphases.

The IFAFS program provided very significant additional competitive grant research funds to what was already available through the National Research Initiative, Sustainable Agriculture Research and Education Program, Integrated Pest Management, and other competitive programs. IFAFS has emphasized outcome-based research to focus on approaches and solutions to real world problems affecting farmers and ranchers, rural communities, and public health and food choices. Priority for funding was for those proposals that were multi-state, multi-institutional, or multi-disciplinary, or that integrated agricultural research, extension, and/or education.

Despite widespread support for IFAFS and despite its brief, but excellent track record for supporting cutting-edge applied research, Congress in recent years has greatly reduced IFAFS funding through legislative riders on the annual appropriations bill. The $35-45 million a year left remaining in the program has been shifted into the National Research Initiative (NRI) competitive grants program as an appropriated subset of NRI funding targeted specifically for outcome-based research that relate directly to the IFAFS objectives. This is a strained and strange way of legislating, but at least it has kept the program alive. The new farm bill provides an opportunity to revisit this issue, restore funding, and focus the program.

In my view, the farm bill should retain IFAFS and the $200 million a year funding baseline to provide new research, education and extension funding for integrated, inter-disciplinary, outcome-based research to:

- improve the competitiveness and viability of small and moderate-size family farms;
- renew the health and vitality of rural communities;
- enhance natural resource protection and ecological health; and
- create new farm and food system approaches to improved public health, food safety, and human nutrition.

In addition to currently designated high priority mission areas for the program, including food safety, food technology, and human nutrition, new and alternative uses and production of agricultural commodities and products, natural resource and environmental management, farm efficiency and profitability, including the viability and competitiveness of small and medium-sized farms, the program should also pursue outcome-based research on:

- sustainable and renewable agriculturally-based energy production options and policies;
- public plant and animal breeding and genetic conservation;
- ecosystem services and outcome-based conservation programs and markets;
- climate change mitigation, including soil carbon management and sequestration and alternative livestock systems;
- farming and ranching opportunities and entry and transition options for new and beginning farmers and ranchers, including socially disadvantaged farmers and ranchers;
- agricultural and rural entrepreneurship and business and community development; and
- local and regional food systems, including mid-tier production, processing and marketing activities and networks.

To be clear, I am not making the case that there should not be increased investment in basic and fundamental research, nor am I making the case that the farm bill should start the process of making those new investments. I am, however, saying there is an equally strong need for a robust competitive grants program for integrated and applied research, education, and extension and that this Committee made the right decision in creating IFAFS in the first place and then increasing its mandate and funding in the last farm bill. I would strongly encourage you to continue in this vein, maintaining the program, restoring its funding for 2008 and 2009, and then keeping its funding intact for the years following. If an institute of some kind is created to invest more in basic research, in my mind, the two programs could stand proudly side-by-side, and, with a reasonable degree of coordination, could work quite well together.

Let me add one quick word about program design. I have had experience with technical and peer review in a number of research and extension programs. From that experience, I draw a number of important learnings. First, there is an important role for both merit and relevancy review. All competitive grants programs should include both facets and both should be rigorous. Second, stakeholder involvement, including farmer and other end-user involvement, is very helpful for more applied research programs and even sometimes for more basic research. Third, if a program emphasizes interdisciplinary research, it is critical for review panels to also collectively represent the views of a diversity of disciplines, including at least one member with expertise in technology assessment. Finally, between annual requests for proposals, it improves the programs and increases public interest in the research field if program priorities are open for public comment on an ongoing basis.

Organic Research, Education and Extension

Organic farming provides multiple benefits that contribute to U.S. strategic goals for agriculture including: a safe and secure food system; environmental protection; increased trade opportunities; improved human health and nutrition; and prosperous rural communities. Organic agriculture markets have grown at a remarkable rate in the range of 15 to 20 percent every year over this last decade and it appears that growth is not going to slow down any time soon.

Unfortunately consumer demand is far outpacing supply. We are beginning to lose markets to foreign competition because of our failure to promote organic agriculture as a matter of policy. We should set an ambitious goal -- to supply 15 percent or more of our nation's food supply from organic farms within ten years – and then develop good policy to help achieve it.

Federal agricultural research dollars dedicated to organics are disproportionately low in relation to the size of the organic industry. Only since 1998 has organic research been funded at all, and it currently receives far less than a proportionate share of federal agriculture research dollars. In FY 2004, USDA research and extension expenditures equaled $2.5 billion, but only about $10 million (0.4 percent) went to organic-specific research and extension.

Organic research programs should receive a fair share of USDA resources, one reflecting the growth and opportunities of the organic sector, which currently represents three percent of total U.S. retail food sales and continues to grow by nearly 20 percent a year. USDA should both expand programs explicitly targeted to organic agriculture and increase the specific attention given to organic farming and ranching systems across the full range of federal agricultural research and extension programs.

In 2004, the Agricultural Research Service spent about $3.5 million on organic-specific projects, or about 0.35 percent of ARS annual expenditures. A framework of "fair share" funding of organic agricultural research, based on the organic share of U.S. food sales, calls for at least a 9-fold increase in ARS resources explicitly allocated to organic. Moreover, if we are going to grow the organic sector and make better use of its ability to solve environmental problems and help moderate-scale family farms prosper, then we need to be working toward a much larger increase.

Last fall I participated in an ARS workshop to lay out research priorities for the next five years. It became clear during the planning workshop that ARS has many scientists with interest, expertise and motivation to do research on organic systems. What is lacking is funding to support those research objectives.

The Integrated Organic Program (IOP) is a competitive grants program managed under the Cooperative State Research, Education and Extension Service (CSREES) Plant and Animals Systems division. The IOP is comprised of the farm bill's Organic Research and Extension Initiative, funded with mandatory farm bill dollars ($3 million annually under the terms of the 2002 Farm Bill), and the Organic Transitions Program, funded with discretionary dollars through the annual appropriations process (currently about $2 million a year). Because of the high level of interest in this program, only about 10 percent of qualified applicants have been able to receive funding. Demand for this program is expected to grow rapidly as the sector as a whole continues to expand.

Recently I had the opportunity to review a number of grant projects from the USDA Integrated Organic Program (IOP). The quality of research and extension work being done under this program is impressive. Much progress has been made in understanding how natural ecosystems regulate soil fertility and provide protections against disease and pest infestations. Innovative application of this new knowledge is helping researchers design integrated organic farming systems that preclude the need for the use of pesticides and synthetic fertilizers.

This integrated systems research fostered by the IOP would not likely have been undertaken in conventional agriculture research programs, which instead often focus on efficacies of pesticide and fertilizer use. However, research findings from the IOP are fully applicable to conventional agriculture and should help reduce loadings of pesticides and fertilizers to our natural resources.

Last week I served on the review panel assigned the task of recommending which of the 60 research proposals submitted to the IOP for FY07 should be funded. It was a difficult task because at least 30% of the proposals were truly outstanding and the IOP budget allowed funding for only about 10% of them.

The relative lack of capacity within Extension for organic services and technology transfer is also a limiting factor for organic conversion. As funding ramps up for the IOP, this barrier might begin to be lowered. Ideally, each state will commit to putting in place regional organic specialists, who in turn will work with the established organic education non-governmental organizations on the ground and with established organic farmers to develop state plans and outreach efforts to provide producers with the information they need to transition and become successful.

Here is a framework I would suggest the Committee think about for moving forward on organic research, education, economics and extension.

First, as you contemplate multiple proposals for major restructuring of USDA-REE agencies and federal funding for land grant and other universities, do not allow organic research to get lost in the shuffle. We need to maintain and build on the meager but important programs we currently have, not allow them to be absorbed and then redirected and forgotten about.

Second, I certainly hope the Committee will be moving forward with farm bill provisions for organic outside of the research title, with initiatives like organic certification cost share, organic conversion technical and financial assistance, improvements for organic crop insurance, and the like. Organic research activities should fit within an overall framework. Legislative policy should address the needs and opportunities of organic agriculture as a whole, taking an integrated approach to policy goals and funding levels. Appropriate configuration of agency roles, and objectives should follow logically from the overall integrated strategy.

Third, steps should be taken to provide organic food and farming with its fair share. Established trends will take organic "market share" to over 10% by FY 2012. Due in part to the dearth of research and development funding, U.S. producers will fall further behind the growing requirements for organic supplies, and the balance of trade in organic goods will continue to worsen. Given market share and market trends, it is entirely reasonable for the total federal investment in organic research and extension to average $120 million or more over the coming five years, even if total research funding remained stagnant.

That level of investment might not be possible to achieve overnight, but in the context of the farm bill, I would suggest a major down payment be made by increasing the Integrated Organic Program from $3 million to $15 million per year and instituting a national program in organic at the Agriculture Research Service with at least $25 million in annual funding. Alternatively, a

single $40 million competitive grants program could be created out of the IOP that would involve ARS and CSREES or whatever restructured REE agency might be created. With some additional discretionary funding and with some organic projects being funded under other competitive grants programs, a $40 million annual organic specific funding level in the farm bill would put us on the path toward a fair share.

Fourth, it's not all about funding, of course. We need to establish permanent scientific and administrative leadership positions to coordinate all REE agency activities in organic agriculture. There needs to be long-term core capacities within each region of USDA-ARS, including the National Agriculture Library. We need to provide capacity for state and multi-state organic extension services. Organic data collection program efforts have started, but the information flow continues to lag far behind the needs of the industry. I would hope the agencies are looking carefully at these needs and responding with accelerated and coordinated efforts.

Public Plant and Animal Breeding Research

The nation's agriculture is at a critical juncture, with our capacity to conserve and further develop publicly available crop and livestock varieties and breeds seriously limited. Research dollars for classical plant breeders have declined significantly. We desperately need to support the development of public varieties that meet the unique needs of organic and sustainable agriculture. Numerous organizations and academics have voiced concern about the erosion of the infrastructure and funding for public plant and animal breeding in the U.S. Many of these concerns are documented in a report entitled Reinvigorating Public Plant & Animal Breeding for a Sustainable Future (Dec. 2005) which was prepared by the Sustainable Agriculture Coalition (posted on the web at www.msawg.org/pdf1/Seeds&Breeds.pdf).

The 2007 Farm Bill provides an excellent opportunity to reinvigorate and improve our public crop and livestock breeding programs, contributing to our long term food security, increased economic opportunities for farmers and ranchers, and improved food quality. A starting point would be to include and expand on report language provided by the Senate Appropriations Committee in the FY2007 Agriculture Appropriations bill that directed USDA within the NRI " . . . to establish a specific category of grant application requests for classical plant and animal breeding to foster more diverse, energy efficient, and environmentally sustainable agricultural systems." The Farm Bill should clearly designate classical plant and animal breeding as a priority within the NRI, IFAFS, and any new competitive grants programs, and should provide for longer term grant periods for this work.

In addition, the 2007 Farm Bill should reauthorize the National Genetic Resource Program established in the 1990 Farm Bill and increase financial and personnel support for the collection, preservation and evaluation of germplasm collections and for increased public use of the rich sources of genetic diversity in the U.S. germplasm collections. The Agricultural Research Service plant and animal national programs should be directed to accelerate long-term research on plant and animal breeding, including the development of finished varieties. The aim should be to foster more diverse, energy efficient, and environmentally sustainable agricultural systems.

In addition, through both ARS and CSREES, funding should be provided for partnerships with non-profit organizations and farmers and ranchers with a goal of increasing publicly available

seeds and animal germplasm for sustainable and organic production systems, based on the models developed by the Farmer Cooperative Genome Project, the Public Seed Initiative funded by IFAFS, and the Organic Seed Partnership funded by the IOP. Some of these funded partnerships should provide incentive programs for farmers and farmer associations to participate in testing, selection, seed increase, and evaluation of plant varieties in germplasm repositories.

Sustainable Agriculture Research and Education (SARE) Program & The National Sustainable Agriculture Information Service (ATTRA)

USDA currently has two programs that generate and provide a wealth of research information for the nation's sustainable and organic farmers and ranchers. During my time with the Extension Service here in Washington as National Program Leader for Soils, I had the exciting privilege to help get both programs started, and now, from the vantage point of a farmer and end user of the research and information, I applaud them for the great things they have achieved in the intervening years.

The first is the Sustainable Agriculture Research and Education (SARE) program, which will celebrate its 20th birthday in 2008. The SARE Program, created by the 1985 and 1990 Farm Bills and administered by the Cooperative State Research, Education and Extension Service (CSREES), has been the flagship research program for sustainable agriculture at USDA. SARE has consistently won awards for being a model USDA program, with strong farmer participation, practical, outcome-oriented research results, a cost-effective regional delivery system, and great customer service and public outreach. SARE projects involve farmers and ranchers directly in research as the primary investigator in small producer grants or sometimes as cooperators in larger research and education grants.

In addition, SARE's Professional Development Program grants provide information and training on sustainable systems to a wide array of USDA and university personnel, extension agents, conservation professionals, and others who provide technical assistance to farmers and ranchers. I also note that with its experience in working with farmers to test and establish new sustainable agricultural systems, the SARE program is well-positioned to be a key player in the research and technical assistance needed to develop cellulosic feedstocks for bioenergy in sustainable perennial or rotational plant systems which can also provide forages and hay for livestock.

In the 1990 Farm Bill, Congress determined that SARE should be funded at no less than $60 million a year, consistent with recommendations a year earlier from the National Academy of Sciences. Yet, despite this acclaim, Congress has never provided more than $19 million annually for the program. Sadly, the current appropriation is several million dollars lower. I would strongly urge every member of this Committee to submit a $20 million or higher appropriations request for the FY 2008 funding cycle. While this is still far below what the program should be receiving, it would nonetheless be fitting for the program to reach $20 million in its 20th year.

The SARE program does not require a reauthorization. I do want to note my support, however, for Senator Russ Feingold's farm bill proposal to focus attention on the one element of the original SARE authorization – a federal-state matching grant program to enhance sustainable agriculture research programs and centers at the state and university level. Senator Feingold's

Rural Opportunities Act would provide direct farm bill resources to begin this long-delayed matching program. I applaud his efforts and encourage the Committee to seriously consider his proposal.

The National Sustainable Agriculture Information Service, also known as ATTRA, provides information and technical assistance to farmers, ranchers, extension agents, educators, and others involved in sustainable agriculture in the United States. ATTRA was authorized as part of the research title of the 1985 Farm Bill. ATTRA is a valuable complement to the SARE program and other USDA research programs through its provision of readily accessible sustainable and organic farming information to farmers and ranchers across the nation. More recently, ATTRA has also expanded resources for farm energy conservation and renewable energy production.

With a shoestring budget of only $2.5 million per year, the ATTRA project funds more than 20 agricultural specialists working in six locations around the country who answer farmers questions over a hotline and prepare ATTRA publications and customized research reports. Requests for ATTRA's reports and information have grown from 2,900 in 1987 to more than 35,000 in 2006. To keep pace with this increased public demand for ATTRA's services, I urge members of this the Committee to support an increase in funding for ATTRA to $3.0 million in FY 2008 in the funding requests to the Appropriations Committee.

Allow me to make a personal observation about the recent FY 2007 funding bill. Shockingly, a program authorized by the Farm Bill and funded by Congress in each of the past 20 years was, as you say in Washington, "zeroed out" as an "earmark". It is difficult for me to understand how it is possible for a national program, authorized by the Farm Bill, and funded consistently over two decades to suddenly come to be defined as an earmark. As the Committee of jurisdiction, I hope you will not sit by and allow this unfair and frankly mistaken attack to occur without a response. I encourage you to do whatever you can to help ensure that USDA funds the program in 2007, and then, as you work on the farm bill, would suggest that it might be time to revisit and reauthorize the program, providing it with a new home within sustainable agriculture at CSREES. You will need to talk with those much closer to the program than I am to determine just how that should be done, but as a farmer who uses ATTRA materials and regularly refers other farmers to them, I encourage you to find a workable solution.

In closing, my wish for the farm bill is a renewal and expansion of funding for the full scope of agricultural research, education and extension. Agricultural research programs should incorporate stakeholder participation at every step in the process, from setting priorities to accessing and assessing the results. We need a balanced federal portfolio, covering both basic and outcome-based research, with a strong emphasis on integrated activities and interdisciplinary systems work. And we need to begin to level the playing field by increasing our investments in organic and sustainable agriculture research and extension. Thank you for the opportunity to testify. I would be happy to try to answer any questions you might have.

DOCUMENTS SUBMITTED FOR THE RECORD

MARCH 7, 2007

Senator Tom Harkin
March 12, 2007

Questions for Dr. Gale Buchanan, USDA

Formula Funds

1. I asked at the hearing about formula funds, but I'd like to get a more detailed answer for the hearing record.

   Please provide details on how the formulas for distributing research, extension, and education funds work, all factors they are based on, and how each factor is weighted.

   How have the formulas changed since they were first implemented in 1887?

Energy Research

1. An aggressive program of focused research on energy will have tremendous payoffs in the energy contributions of our agricultural sector 10 and 20 and more years ahead. During the hearing, you said USDA dedicated approximately $27 million to biomass and bioenergy research last year.

   Please provide information on which specific USDA research programs received a portion of the $27 million.

   How has your research portfolio changed over the past 5 years or so for all the major research programs funded by USDA, including research through ARS, the State Agricultural Experiment Stations, and the National Research Initiative?

2. USDA's farm bill proposal includes $50 million a year for an Agricultural Bioenergy and Bio-based products Research Initiative.

   Is this amount in addition to current research funding or a redirection of current funding?

   If it is in addition to current funding, what is the total amount of money USDA would spend on energy research if the proposal were adopted?

3. One of the most pressing energy technologies, and one that can play a critical role in addressing our dependency on oil, is biofuels from cellulosic feedstocks

   What are the most important research efforts that USDA is currently supporting in this area?

4. Our goals for energy will have different impacts on various sectors of agriculture. As such, there are other areas of energy research that should be a focus as well.

Senator Tom Harkin
March 12, 2007

For example, research on distillers dried grains solubles (DDGS) is important because hogs and poultry cannot utilize DDGS as easily as cattle, and DDGS are an abundant by-product of the ethanol industry.

Please provide information on USDA programs that research the usability of DDGS for hogs and poultry, and how USDA provides information to producers.

Does USDA's farm bill proposal take into account this increased need for research of DDGS? How much money does it allocate to it?

I hear concerns from producers that they don't always have an available supply of DDGS because the ethanol facilities are more interested in selling the byproducts as quickly as possible to overseas customers.

What research has USDA done to increase awareness, coordination and market research between the ethanol industry and producers?

The agriculture sector is importing increasing amounts of fertilizer and likely will require more fertilizer given the projected increase in ethanol production.

Is USDA sponsoring any research on local production of ammonia using renewable resources?

Animal manure can be a valuable energy resource. I know we have some digesters operating in this country, but I also think we could – and should – be deploying a lot more digesters.

What research is USDA sponsoring to improve the function or reliability or economics of such digesters?

Animal Diseases

1. We are moving forward on the construction of the animal disease facilities in Ames, the premier facility for this purpose in the nation. I have been working towards that goal for over 15 years. But, I am very concerned that the facility is left incomplete with the current budget.

   I understand that there has been a decrease in space in the Biosafety Level 2 animal holding facilities, and that USDA has completely eliminated a needed facility for dairy cows.

   Please provide the Committee with the original plans for the Biosafety Level 2 holding facilities envisioned in 2001 when we moved towards construction. Also, provide the present plan for what is now actually scheduled to be completed.

Senator Tom Harkin
March 12, 2007

Is the facility that is now planned adequate in regard to dairy cows?

What is the reduction in the number of large animals, separated out by type of animal, that will be able to be maintained in these facilities, as currently planned, compared to what had been planned in 2001?

2. The budget provides $2.5 million for new ARS equipment for the new Ames facilities, with the assumption that much of the existing equipment can continue to be used.

   What amount did ARS scientists at Ames request for new equipment for FY 2007 and FY 2008?

3. Over the last quarter century we have seen an unfortunate emergence of a number of important animal diseases including bovine spongiform encephalopathy (BSE), H3N2 swine influenza, West Nile Virus, Porcine Circovirus, and many others. The need to certify animals as free of various diseases is increasing in international trade. More importantly, we are seeing growing threats of emerging animal diseases that pose some danger for humans.

   Although we have spent considerable sums on new facilities, I am concerned that ARS is not doing enough to even maintain our research capacity in terms of staff.

   I understand that the number of scientists at the ARS Ames National Animal Disease Center has declined from 80 in 1980 to 55 now. The number of technical staff at the APHIS Veterinary Biologics Laboratory has dropped from 76 full time technical staff in 1980 to 40 now.

   Are we losing our capacity to deal with emerging diseases even as the danger is growing?

QUESTIONS

ALL PANELISTS

1. In my state, we are fortunate to have an 1890 Institution with a strong history of agricultural research. What will each of your respective proposals do to address the 1890, 1994, or even smaller 1862 Land Grants?

2. In Mississippi, the Agricultural Research Service is considered a very successful research institution. Two of the proposals submitted today recommend changing the ARS structure. Would your proposals have an adverse effect on the important ongoing research at ARS facilities located throughout the county?

Questions
Senator Mike Crapo
Senate Agriculture Committee
"Investing in Our Nation's Future through Agricultural Research"
Wednesday, March 7, 2007

Dr. Gale Buchanan

1) As you may know, the Department of Energy just awarded $385 million in grants for six cellulosic ethanol plant projects. Iogen Biorefineries was selected as the recipient of one of these grants to build a cellulosic ethanol plant in Idaho to process wheat straw. While the idea of being able to create fuel from cellulosic ethanol is attractive because of the vast amount of biomass resources, the process is still more costly than production of corn-based ethanol, and R&D is still ongoing to find a way to decrease the cost of production.

   In the Administration's proposal, $50 million of mandatory spending per year over 10 years will go toward the Agriculture Bioenergy and Biobased Products Research Initiative. Do you have a breakdown of how much of this spending will be devoted to cellulosic ethanol research vs. other biobased products like corn-based ethanol and biodiesel?

Senate Agriculture Committee:
Investing in Our Nation's Future Through Agriculture Research
Senator Blanche L. Lincoln
March 7, 2007
Questions for the Record

1) Dr. Armstrong, how widespread and uniform would you characterize the land grant support for the CREATE-21 proposal?

2) Dr. Buchanan, Iowa State recently came out with a study (November, 2006) which found that the federal government gets more bang from its buck from formula rather than competitive funds, yet the Administration continues to seek augmentation of competitive funds at the expense of formula funds. How does this impact the Department's position on this issue?

NATIONAL INSTITUTE FOR FOOD AND AGRICULTURE

A PROPOSAL

Report of the
Research, Education and Economics
Task Force
of the
United States
Department of Agriculture

July 2004

RESEARCH, EDUCATION AND ECONOMICS
TASK FORCE
of the
UNITED STATES
DEPARTMENT OF AGRICULTURE

July 2004

Secretary Ann M.Veneman
U.S. Department of Agriculture
Office of the Secretary
14th Street & Independence Avenue, SW
Washington, DC 20250

Dear Secretary Veneman:

It is an honor to transmit the Report of the Research, Education and Economics Task Force that you appointed in January 2003.

Our group is convinced that the effective application of modern life science to agriculture will yield great boons to farmers and to the American public.

We recommend that to obtain an adequate amount of high quality science, a National Institute for Food and Agriculture be formed within the USDA. We go on to propose structures and methods of operation designed to assure the Department, the Congress and the American people that the science would be of the highest quality and relevant to the needs of the nation.

Thank you for allowing us to address some very important issues.

Yours sincerely,

William H. Danforth

William H. Danforth
Chair

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REPORT OF THE USDA RESEARCH, ECONOMICS AND EDUCATION TASK FORCE

APPENDICES AND FIGURES

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*For further information about any member of the Task Force, please contact Kathryn Boots, USDA, at 202-720 5923 or katie.boots@usda.gov.

Acknowledgements

The Task Force is grateful to the many individuals who assisted us in our work by giving us encouragement, advice and information. We have listed many of these individuals in the final appendix to the report, entitled "Consultants to the Task Force."

We especially thank Dr. Joseph J. Jen, Under Secretary for Research, Education and Economics, for his guidance, for his wisdom, for helping us understand departmental matters, and for our meeting with leaders of the Research, Education and Economic functions. We are also grateful to R. Ronald Bosecker, Administrator, National Agricultural Statistics Service; Colien Hefferan, Administrator, Cooperative State Research, Education and Extension Service; Susan E. Offutt, Administrator, Economic Research Service; and Caird E Rexroad Jr., Acting Associate Administrator, Agricultural Research Service, for speaking to us. Ms. Katie Boots, Special Assistant to the Under Secretary of Research, Education and Economics, gave us her unflagging support and provided direction that was instrumental in helping us best comply with our charge.

Several individuals from outside the USDA made enlightening presentations to us: Martin Apple, President, Council of Scientific Society Presidents; Mary Clutter, Assistant Director, Biological Sciences Directorate, National Science Foundation; Anthony Fauci, Director, National Institute of Allergy and Infectious Diseases, National Institutes of Health; Peter Raven, Director, Missouri Botanical Garden; and Mary Wooley, President, Research!America.

We are very grateful to Chris Hasselmann, Ph.D., and Joseph M. Tonon, Ph.D., for their research, help in preparation of the report, and general assistance. Mary Ann Noel, special assistant to the chairman of the committee, was essential to keeping the work on track. Marla Means, assistant to Ms. Noel, patiently made many corrections to the report.

Karen Keeler Rogers, M.Ed., of KKR & Company, edited the document to make it more readable.

All of these individuals have been essential to our work. None can be blamed for any shortcomings.

Legislative Charge
THE MANDATE OF THE TASK FORCE; THE AMENDED MANDATE OF THE TASK FORCE

SEC. 7404. REVIEW OF AGRICULTURAL RESEARCH SERVICE.

(a) IN GENERAL.—Not later than 90 days after the date of enactment of this Act, the Secretary shall establish a task force to—

(1) conduct a review of the Agricultural Research Service;

and

(2) evaluate the merits of establishing one or more National Institutes focused on disciplines important to the progress of food and agricultural science.

(b) MEMBERSHIP.—

(1) IN GENERAL.—The Task Force shall consist of 8 members, appointed by the Secretary, that—

(A) have a broad-based background in plant, animal, and agricultural sciences research, food, nutrition, biotechnology, crop production methods, environmental science or related disciplines; and

(B) are familiar with the role and infrastructure used to conduct Federal and private research, including—

(i) the Agricultural Research Service
(ii) The National Institutes of Health
(iii) the National Science Foundation
(iv) the National Aeronautics and Space Administration
(v) the Department of Energy laboratory system; or
(vi) the Cooperative Sate Research, Education, and Extension Service.

(2) PRIVATE SECTOR.—Of the members appointed under paragraph (1), the Secretary shall appoint at least 6 members that are members of the private sector or come from institutions of higher education.

(3) PLANT AND AGRICULTURAL SCIENCES RESEARCH.—Of the members appointed under paragraph (1), the Secretary shall appoint at least 3 members that have an extensive background and preeminence in the field of plant, animal, and agricultural sciences research.

(4) CHAIRPERSON.—Of the members appointed under paragraph (1), the Secretary shall designate a Chairperson that has significant leadership experience in educational and research institutions and in depth knowledge of the research enterprises of the United States.

(5) CONSULTATION.—Before appointing members of the Task Force under this subsection, the Secretary shall consult with the National Academy of Sciences and the Office of Science and Technology Policy.

(c) DUTIES.—The Task Force shall—

(1) conduct a review of the purpose, efficiency effectiveness, and impact on agricultural research of the Agricultural Research Service;

(2) conduct a review and evaluation of the merits of establishing one or more National Institutes (such as National Institution for Plant and Agricultural Sciences) focused on disciplines important to the progress of food and agricultural sciences, and if establishment of one or more National Institutes is recommended, provide further recommendations to the Secretary, including the structure for establishing each Institute, the multistate area location of each Institute, and the amount of funding necessary to establish each Institute; and

(3) submit the reports required by subsection (d).

(d) Reports.—Not later than 12 months after the date of enactment of the Act, the Task Force shall submit to the Committee on Agriculture of the House of Representatives, the Committee on Agriculture, Nutrition, and Forestry of the Senate, and the Secretary—

(1) a report on the review and evaluation required under subsection (c) (1); and

(2) a report on the review and evaluation required under subsection (c) (2).

(e) FUNDING.—The Secretary shall use to carry out this section not more than 0.1 percent of the amount of appropriations available to the Agricultural Research Service for fiscal year 2003.

CONFERENCE REPORT ON H.R. 1559, EMERGENCY WARTIME SUPPLEMENTAL APPROPRIATIONS ACT, 2003

Mr. Young of Florida submitted the following conference report on the bill (H.R. 1559) making emergency wartime supplemental appropriations for the fiscal year ending September 30, 2003, and for the purposes:

[Page H3358]

CONFERENCE REPORT (H. REPT. 108-76)

The committee of conference on the disagreeing votes of the two Houses on the amendment of the Senate to the bill (H.R. 1559), "making emergency wartime supplemental appropriations for the fiscal year 2003, and for the other purposes", having met, after full and free conference, have agreed to recommend and do recommend to their respective Houses as follows:

That the House recede from its disagreement to the amendment of the Senate and agree to the same with an amendment as follows:

In lieu of the matter proposed to be inserted by the Senate amendment, insert the following: *That the following sums are appropriated, out of any money in the Treasury not otherwise appropriated, for the fiscal year ending September 30, 2003, and for other purposes, namely:*

TITLE I—WAR-RELATED APPROPRIATIONS

CHAPTER 1

DEPARTMENT OF AGRICULTURE

TITLE II—MISCELLANEOUS AND TECHNICAL APPROPRIATIONS

CHAPTER 1

SUBCOMMITTEE ON AGRICULTURE, RURAL DEVELOPMENT, AND RELATED AGENCIES

GENERAL PROVISIONS

SEC. 2101. (a) Section 756 in Division A of Public Law 108-7 is amended by striking "section 7404" and inserting in lieu thereof "sections 7404 (a)(1) and 7404(c)(1)".

(b) Section 7404 (e) Of Public Law 107-171 is amended by striking "0.1 percent of the amount of appropriations available to the Agriculture Research Service" and inserting in lieu thereof "$499,000 of the amount of appropriations available to the Department of Agriculture".

Executive Summary

RECOMMENDATIONS OF THE TASK FORCE

The United States Department of Agriculture (USDA) Research, Education and Economics Task Force, appointed by the Secretary of the U.S. Department of Agriculture in 2003 at the request of the U.S. Congress, respectfully recommends the following:

- The formation of a **National Institute of Food and Agriculture (NIFA)** within the USDA for the purpose of ensuring the technological superiority of American agriculture. The Institute should report directly to the Secretary of Agriculture. It should be kept separate and managed differently from existing programs so as to develop its own culture and establish its own methods of operation.

- The **mission of NIFA** should be to support the highest caliber of fundamental* agricultural research in order to:
  - increase the international competitiveness of American agriculture;
  - develop foods that improve health and combat obesity;
  - create new and more useful products from plants and animals;
  - improve food safety and food security by protecting American plants and animals from insects, diseases, and the threat of bioterrorism;
  - enhance agricultural sustainability and improve the environment;
  - strengthen the economies of the nation's rural communities;
  - decrease American dependence on foreign sources of petroleum by developing bio-based fuels and materials from plants; and
  - strengthen national security by improving the agricultural productivity of subsistence farmers in developing countries to combat hunger and the political instability it produces.

*Fundamental research is research that addresses the frontiers of knowledge, while it leads to practical results and/or to further scientific discovery.

- NIFA should accomplish its mission by awarding **competitive peer-reviewed grants** that support and promote the very highest caliber of fundamental agricultural research. The members of the Task Force define fundamental science as science that advances the frontiers of current knowledge so as to lead to practical results and/or further scientific discovery.

- NIFA's mission should **supplement and enhance, not replace,** the existing research programs of the U.S. Department of Agriculture.

- NIFA should be a **grant-making agency** funding proposals submitted by both individual scientists and single and multi-institutional research centers.

- **Mechanisms should be put into place** to assure that the science funded by NIFA is both of the highest scientific caliber and relevant to national needs and priorities. These mechanisms should include:
    - Committees of Scientists who apply rigorous merit review to all proposals.
    - A Standing Council of Advisers to assure the relevance and importance of the science NIFA funds.

- The **Director of NIFA** should be a distinguished scientist appointed by the President of the United States and confirmed by the United States Senate. The Director should be assisted by a Senior Staff of highly accomplished scientists.

- **Three offices of modest size** should be created to assist the Director and the Standing Council of Advisors. The offices should assure that NIFA-funded research is the most effective for and relevant to national needs and priorities. The offices are:

    - An **Office of Assessment and Scientific Liaison,** which will monitor the effectiveness of NIFA's scientific expenditures and coordinate its research efforts with those of other public research programs in the life sciences.

- An **Office of Scientific Personnel,** which will work with scientific and agricultural experts to assess the adequacy of the numbers and qualifications of scientific personnel in agriculture and related fields and will make recommendations for training programs should any be necessary.

- An **Office of Advanced Science and Application,** which will match national needs to research advances in order to help facilitate solutions to issues of national importance.

- NIFA's annual budget should build to **$1 billion over a five-year period**. When fully operational, management costs should be limited to 5 percent of the total budget.

- NIFA should be **located in Washington, DC** so that it is in close proximity to the headquarters of the nation's other publicly funded scientific agencies.

- **NIFA should be independent of all existing management structures of the USDA**. By doing so, it will develop its own culture of scientific excellence and innovation.

- Congress should **establish funding that is stable enough to support a sufficient number of well-conceived research projects** and give NIFA **clear responsibility for overseeing and managing scientific and technical judgments**.

- **Action** to adopt these recommendations should take place **without delay**.

The full report of the Task Force follows.

Introduction

FIVE CONVICTIONS THAT UNDERLIE THIS REPORT

Five convictions underlie the primary recommendation of this report to form the National Institute of Food and Agriculture. These convictions served as guides to the USDA Research, Education and Economics Task Force as we considered how best to meet the pressing needs of American agriculture.

1. **American agriculture faces critical challenges.**

   The Task Force believes there is an impending crisis in the food, agricultural, and natural resource systems of the United States, which are currently threatened on several fronts. For example, U.S. soybean growers are no longer the world's lowest cost producers; exotic diseases and pests threaten crops and livestock; obesity has reached epidemic proportions; agriculturally related environmental degradation is a serious problem for the United States and other parts of the world; and certain animal diseases threaten human health.

2. **Continual innovation in agriculture is the key to meeting these challenges.**

   The members of this Task Force agree with many Americans that our nation's future depends on our ability to innovate. Innovation – in every field – has been, and continues to be, essential to America's success in war and in peace.

   Agricultural innovation has served Americans well for generations. It has brought hybrid corn, higher yielding wheat, and the "Green Revolution" – all of which enhanced the world's food supply by increasing yields on existing acres. Since 1960, the world's population has tripled with no net increase in the amount of land under cultivation. Currently, because of innovation, only 1.5 percent of the population of the United States provides the food and fiber on which the rest of us depend. With so few people now involved in agricultural production, it is not surprising that many of us overlook the central role agriculture plays in maintaining the health and welfare of all Americans and in husbanding our land and water so as to provide for our children and grandchildren. The question now is: How can we best ensure that the innovation, so important in our past, continues into the future?

3. **Fundamental scientific research is critical to continued innovation in American agriculture.**
Where will the next innovations in agriculture be generated? As in the past, many ideas for innovation will evolve from the farmer's experience, from the supplier's knowledge, and from the imagination of those who turn commodity crops into value-added products.

However, many of the important innovations of the future – those that are totally new, those that solve long-standing problems, and those that represent significant breakthroughs – will come from a deepening understanding of how plants and animals reproduce, grow, and mature; how they produce nutrients; how they protect themselves against pests and diseases; how they utilize water, minerals, and nitrogen from the soil; how they interact with the environment, and how they can be beneficially modified. Fundamental agricultural research unearths these important understandings that can then be linked to the practical needs of all Americans. Continued scientific advances, some of which will be dependant on ideas and technologies from other fields, are necessary to build and replenish the knowledge base necessary for practical innovation. Just as modern irrigation draws on the water in aquifers, agricultural innovations draw on the well of fundamental scientific research.

4. **Opportunities to advance fundamental knowledge of benefit to American agriculture have never been greater.**
These expanded opportunities are the result of amazing progress in the life sciences over recent decades, thanks in large part to the generous support of the federal government through the National Institutes of Health (NIH) and the National Science Foundation (NSF). New technologies and new concepts have speeded advances in the fields of genetics, cell and molecular biology, and proteomics. The application of the physical sciences and engineering to the life sciences have opened new vistas. Without this reservoir of scientific knowledge and new research technologies, we could not make the recommendations contained in this report.

Today, much scientific knowledge is ready to be mined for agriculture, and science continues to produce new knowledge at an increasing rate. Many advances in other life sciences will feed quickly into agricultural sciences because all living things share the same genetic code and many of the same biochemical processes.

[See Appendix 1 for our vision of the future of science-based agriculture.]

5. **Publicly sponsored research will be necessary to take full advantage of the opportunities.** The members of the Task Force believe that publicly sponsored research will be essential to continued agricultural innovation. Other nations recognize this fact, and are making significant investments using peer-review to assure that their science is high quality.[i]

   Corporate research is valuable, but the success of American agriculture cannot depend only or primarily on corporate research any more than the health of Americans can depend only or primarily on the research of pharmaceutical companies. For-profit companies must, of necessity, focus their efforts on the development of products that will provide an adequate return on investment to keep the company viable and provide the resources for the development of yet newer products; therefore, American companies are not likely to devote significant research dollars to the study of the long-term effects of agriculture on the environment, the long-term sustainability of agriculture, or other matters of public health and welfare. These areas of investigation must depend on government-funded research for which, fortunately, there is strong public support. (See Figure 1.)

   [See Appendix 2 for a lengthier discussion of this topic.]

Chapter 1

MODELS OF FEDERALLY SUPPORTED LIFE SCIENCE RESEARCH

Realizing the need for change in American agricultural research, the Task Force turned to existing, successful models for guidance. We chose the NIH and NSF. Both institutions efficiently manage highly competitive, merit-based, peer-reviewed grant programs that attract and support the nation's leading scientists. Both encourage open competition for grants, and both provide grants of sufficient size so that outstanding scientists from a variety of disciplines are able to carry out first-class research appropriate to the missions of the agencies. Most important, the science supported by these two agencies has greatly benefited the American people.

Modern life science research funded by the NIH and the NSF has provided the United States and the world with a steady flow of practical benefits, which is a major reason why these institutions are valuable as models for NIFA. Their work has led to and continues to lead to spectacular advances in the prevention, diagnosis and treatment of human disease, such as measles, diphtheria, whooping cough, German measles, haemophilous influenza type b meningitis, and polio. Physicians can now control and even cure some cancers, and we have seen dramatic improvements in the treatment of mental illnesses and in the reduction of cardiovascular disease. In addition, these federal agencies have shown the capacity to evolve continuously to meet the new opportunities and challenges that confront our society.

Chapter 2

THE NATIONAL INSTITUTE FOR FOOD AND AGRICULTURE (NIFA)

RECOMMENDATION: We recommend the creation of a National Institute for Food and Agriculture (NIFA) in order to meet the challenges that face our nation and our world. We propose an adequately funded NIFA that is structured and managed so as to bring the most advanced modern life sciences to bear on agriculture.

In the opinion of the Task Force, the creation of a National Institute for Food and Agriculture (NIFA) that brings into the USDA a new culture and new operating methods is essential to ensure the innovation in agriculture needed to ensure our nation's successful future. The name we recommend – NIFA – reflects the primary focus of the Institute: Agriculture is more than food, but it is difficult to think of the two separately.

The shape and functions of NIFA are described in the chapters that follow.

Chapter 3

THE MISSION OF NIFA

RECOMMENDATION: The mission of NIFA should be to support fundamental* agricultural research of the highest caliber in order to:

- Increase the international competitiveness of American agriculture.
- Develop foods that improve health and combat obesity.
- Create new and more useful products from plants and animals.
- Improve food safety and food security by protecting American plants and animals from insects, diseases, and the threat of bioterrorism.
- Enhance agricultural sustainability and improve the environment;
- Strengthen the economies of our nation's rural communities.
- Decrease American dependence on foreign sources of petroleum by developing bio-based fuels and materials from plants.
- Strengthen national security by improving the agricultural productivity of subsistence farmers in developing countries to combat hunger and the international political instability it produces.

Each of these areas of research is discussed in the remainder of this chapter.

1. Increase the international competitiveness of American agriculture.

Agriculture is critical to America's economic strength and balance of trade.

- Farming contributed a total of 0.8 percent to the gross domestic product (GDP) in 2001. It further supported an additional 12 percent of GDP through food service production, provision, and trade.[ii]
- Farming employs 1.2 percent of the civilian labor market, and supports almost an additional 16 percent through food service production, provision, and trade.
- Agriculture commodities accounted for 5.3 percent ($52.7 billion) of the nation's exports in 2001.[iii]

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*Fundamental research is research that addresses the frontiers of knowledge, while it leads to practical results and/or to further scientific discovery.

- The overall U.S. balance of trade has been in deficit every year since 1976, yet the nation maintains a positive trade balance in agricultural goods. In 2000, the surplus amounted to $12.6 billion, up from $10.4 billion in 1999. New specialty products and less costly commodities are needed to maintain and further expand this advantage.

American agriculture cannot stand still. As globalization increases, so does foreign competition. Inexpensive land and labor provide great advantages to many nations, some of which are investing in their own research. Low cost soybeans from Brazil, raisins from Chile and Turkey, fresh tomatoes from Mexico, apples and tomatoes from China, and many other crops from other lands threaten America's trade advantages.[iv]

Every nation is working to make its farming more efficient and more productive and its agricultural products less expensive. Now and in the future, American farm products must be competitive both at home and in world markets. America requires highly productive agriculture that is well-suited to the nation's various regional climatic and soil conditions; that minimizes inputs of energy, water, fertilizers and pesticides; that is tolerant, as appropriate, to drought and heavy rain, to heat and cold; and that is easy to harvest. The assurance of food safety is also critical, as is the development of new specialty and value-added crops suitable for various regional growing conditions.

A U.S. competitive advantage, once won, will not last because other nations will be moving forward as well. Science-based innovation in agriculture, therefore, must be constant, with new improvements added every year. To meet this challenge, agricultural research must satisfy three criteria: 1) It must be scientifically first-rate; 2) It must be open to the most innovative ideas; and 3) It must help meet national needs. Success will also require persistence because tomorrow's gains depend on today's investments; therefore, we must place high priority on both important long-term goals and urgent short-term needs.

2. Develop foods that improve health and combat obesity.

In March 2003, Eric M. Bost, Undersecretary of Food, Nutrition and Consumer Services, testified that "Poor diets and sedentary lifestyles cost this nation dearly in medical costs, in lost productivity, and most sadly, in the premature death of over 300,000 citizens annually."[v]

In the last 25 years, obesity has increased markedly in industrialized and non-industrialized nations alike. In the United States, approximately 65 percent of adults and 15 percent of children and adolescents are overweight or obese. Obesity is particularly high in women of African-American, Mexican-American and Native American descent. It has been linked to a dramatic increase in type-2 diabetes as well as asthma, cancer, cardiovascular disease, osteoarthritis, and kidney disease. Obesity-associated health care costs account for approximately 7 percent of national expenditures.[vi] A recent report[vii] noted that in the United States, the number of obesity-related deaths is second only to tobacco-related deaths.

Leading edge science can help improve the diets and eating habits of all Americans. Though research in these areas currently is sponsored by the USDA and NIH, NIFA can play an important role by learning how foods can be modified to suit the nutritional needs of the American public, both those who are healthy and those who are not. For example, by modifying fatty acid profiles, the amount of fat contained in both meat and milk may be reduced.[viii]

In the future, modified foods will help treat specific diseases, such as diabetes, and help protect people with genetic predispositions to certain other illnesses. An important goal is to create satisfying, non-allergenic, safe foods with minimal calories and maximum specified nutrients – foods that would promote healthier, longer lives. The addition of macronutrients (e.g. protein) and micronutrients (e.g. vitamins and minerals) can lead to more nutritious foods, and by modifying the composition of meats, scientists may be able to lower fat content and increase the heart-healthy ratio of omega-3 to omega-6 fatty acids. These are only a few ways agricultural science can improve the average American's diet.

3. Create new and more useful products from plants and animals.

Many hopes for agriculture in the future, especially its economic aspects, rest on developing the ability to derive new and more useful bio-based products from plants and animals. In the past, agricultural advances have resulted largely from more efficient production methods using improved seeds coupled with inputs of fertilizers, pesticides, herbicides and water, which together have increased the quantity and lowered the cost of food at home and abroad.

These advances, however, have also increased the financial pressure on most family farmers.[ix] For this reason, the importance of developing specialty and value-added agricultural products is widely recognized. The search is on for new and improved farm products and for more creative uses of both traditional and new products. The potential is great. Rick Tolman, President of the National Corn Growers Association, has said: "Anything that can be developed from petroleum can be developed from corn." The same is true for other cereals, grains, legumes and oilseeds. Products that are biodegradable and recyclable will also add value.

A wide variety of innovative bio-based products from crop plants are currently under development. Ethanol production from corn has been highly publicized, but there is much other potential as well, such as producing low cost pharmaceuticals from plants, egg whites and milk. Scientists are doing early work on many other promising value-added products, including:

- soybean-based biomaterials with desirable, rubber-like properties;
- biodegradable products from corn, such as plastics, solvents and disposable foam for packaging, plates and other uses;
- antibodies and other protein therapeutics produced in corn, tobacco and alfalfa for the treatment of human disease;
- textiles made from corn and other plants that may be used in clothing, bedding, carpeting and automobile interiors;
- new fluids developed from oil-seed crops that have excellent sun-protective qualities and many potential industrial uses; and
- products with unique performance characteristics, such as sturdier cotton or harder or softer wood.

Of the next generation of new drugs, more than half are likely to be biologicals. These medications are derived from human proteins in a process that is lengthy, complex and expensive. The drug industry has no quick or economical way to get these critical drugs from the microscope to the marketplace. The answer to these problems may come from chickens, however. Genetically modified chickens can produce human protein in their eggs. If such a process can be made commercially viable, biological medications could be produced less expensively and in higher volume.[x]

Innovative products such as these can provide important economic benefits to producers and bring new opportunities to small farmers. They also can serve as the basis for new regional industries in rural areas.

4. **Protect the health of agricultural workers, the general public, farm animals and crops from natural causes and from terrorist attacks.**

There are a number of important human health risks that can be understood and prevented through innovative agricultural research. Some of these risks are:

- *Prostate Cancer in Farmers.* Farmers are at greater than normal risk of prostate cancer, the second leading cause of cancer deaths among American men. The best current information links the incidence of prostate cancer in farmers to their use of methyl bromides as fumigants and to several widely used insecticides.[xi] Safer methods of farming and substitutes for potentially dangerous chemicals should be developed.
- *Food-borne Illness.* The Centers for Disease Control estimate there are 76 million cases of sporadic food-borne illnesses in the United States each year. These illnesses annually result in 325,000 hospitalizations and 5,000 deaths. Innovations flowing from research in fundamental agricultural science should significantly reduce the number of annual cases, and, therefore, lower the death rate from these illnesses.
- *Antibiotic-resistant Pathogens.* The use of antibiotics in animal feed may be causing a significant increase in the number of antibiotic-resistant pathogens, which may pose a serious risk to human health.[xii] More study is needed to assess the level of antibiotic resistance, the risks involved, and what should be done about this issue.

- *Prion Diseases:* Prion diseases, such as bovine spongiform encephalopathy (mad cow disease), are on the rise, yet their biology is little understood. Agricultural research can provide a wide body of scientific information that may help control these diseases and help prevent an emergency.
- *Chemical Food Contaminants.* The effects of chemical contaminants in foods, which are of concern to many, are poorly understood and require significantly more research.
- *Animal to Human Disease Transmission.* We need a better understanding of the ways disease passes from animals to humans and of the risks involved. Influenza, AIDS, SARS, "mad cow disease," and West Nile virus are only a few that require intense study.

There are also significant risks to farm animals and crops:

- *Foot and Mouth Disease:* Outbreaks of Foot and Mouth Disease have a significant economic impact. For instance, the disease cost the European Union $10 billion in 2001 and it cost the Republic of China $8 billion in 1997.
- *Avian Flu:* In 2003, eight Asian countries experienced outbreaks of avian influenza, apparently spread to domestic livestock from wild waterfowl. The consequences were catastrophic. During the first three months of the outbreak, 100 million domestic poultry either died or were culled to contain the spread. In order to guard against epidemics in livestock, it is important to understand more about the disease and its reservoirs, how it is spread, and natural and induced resistances.
- *Fungal Diseases of Plants:* Soybean rust is a pernicious fungal disease that is extraordinarily destructive. In past outbreaks, yield losses have ranged from 10 to 80 percent.[xiii] Currently, soybean rust is not found in the United States, but its arrival here is only a matter of time because the disease, which is airborne, already has infected plants in parts of South America. At this time, there is only one containment facility in the United States authorized to conduct research with this fungus and the plants it infects. Considering the virulence of the fungus and the economic consequences of its arrival in the United States, it seems clear that additional research is needed and needed soon.

- *Bioterrorism:* Many of the plant and animal diseases cited above could be used by bioterrorists against the United States. If we are to combat terrorism and protect our people and our food supply, we must invest in innovative agricultural research to learn more about how diseases spread and how the protective mechanisms of plants and animals can be enhanced.

5. Enhance the environment.

The importance of agriculture to the environment cannot be overstated. American farmers and foresters own 75 percent of the nation's privately held land – land that is both fragile and irreplaceable. Much has been done already. For example, agricultural science has made it possible to use no-till farming to help protect currently farmed land. New techniques have provided significant increases in yield that have enabled America to maintain open space, scenic beauty, wildlife habitats, national parks and recreational areas that otherwise would be needed for food production.

However, challenges continue. Considered as a whole, agriculture, as currently practiced, is not sustainable.[xiv] Agriculture uses 70 percent of the nation's fresh water for irrigation, which drains rivers, lowers the water level in aquifers, and increases the mineral content of the soil. Fertilizers and insecticides pollute streams and rivers. Suburban development and new highways reduce the amount of land available for farming. Invasive exotic plants and animals with no natural enemies are threatening native populations in many parts of the country. And, beyond the farm, stocks of ocean fish are being depleted. Much needs to be done, and done quickly, to protect the environment.

Other parts of the world also face significant challenges that will affect the United States sooner rather than later. To satisfy their need for food and fuel, farmers in underdeveloped countries are destroying tropical rainforests at an alarming rate. Population continues to grow in countries currently unable to feed their people. And, as economic standards rise in countries such as the People's Republic of China, their inhabitants are demanding better diets that include more meat. To satisfy this demand, a greater number of acres will be required to raise grain for animal feed, placing even more strain on the land. We view this trend as irreversible because nearly all

humans will have meat in their diet if they can. Consequently, we must further increase the productivity of plants and animals through agricultural science in order to alleviate this pressure for land. As in the past, our greatest hope for the future will be human ingenuity informed by science.

Several examples of the kinds of environmental issues that might be addressed follow:

- developing a better understanding of the fundamental mechanisms underlying carbon sequestration, which can help reduce agricultural production of greenhouse gases and increase soil nutrient quality;
- finding methods to reduce surface and ground water contamination by pathogens, and by phosphorus and nitrogen run-off from animal waste and fertilizers;
- developing ways to control naturally exotic, invasive or noxious plants, insects and microbes to reduce the use of pesticides and herbicides; and
- enhancing current sustainable agriculture and aquaculture technologies.

6. Strengthen the economies of rural communities.

The United States has become increasingly urbanized and suburbanized. This trend, which is likely to continue, and the changing economics of agriculture threaten the economic health of rural communities whose vitality is essential for those who live in them and for the nation as a whole.

To reinvigorate our rural economies, agricultural science must develop value-added farm products that enable American producers better to compete in both American and world markets. Value-added, specialty crops that are well adapted to local climatic conditions, friendly to the environment and low cost can provide higher yields on existing acres and a higher margin of profitability for rural communities. By growing specialty crops for high value markets, farmers can take best advantage of their specific geographic locations, and by using modern information technology rural communities will be able to develop networks of specialty crop centers. Finally, agricultural science also offers opportunities for developing new forms of processing close to areas of agricultural production.

7. **Decrease American dependence on foreign sources of petroleum by developing bio-based fuels and materials from plants.**

Currently the United States depends on petroleum imports for nearly 60 percent of its fuel needs. This undesirable situation combined with increasing environmental concerns has created an urgent national need for domestic energy sources that are clean, renewable and economical enough to be used on a large scale.

For example, using ethanol and biodiesel fuels minimizes the release of toxic substances into the air, including sulfur, carbon monoxide and carbon dioxide. Such fuels are produced from renewable resources, such as corn and soybean oil; the crops used to produce them remove more carbon dioxide from the atmosphere than consumption of the fuel adds back. Several studies have concluded that ethanol can provide about 24 percent more energy when it is burned than is used in its production.[xv]

Modern technology is reducing the cost of ethanol production and making it a more attractive, affordable fuel alternative. Ethanol production is nearly 30 percent more energy-efficient today than it was 20 years ago.[xvi] Nonetheless, it is important to continue to increase the efficiency and lower the cost of ethanol production.

8. **Strengthen national security by improving the agricultural productivity of subsistence farmers in developing countries in order to combat hunger, alleviate human misery, and reduce the political instability they produce.**

Through its foreign policy, the United States has long encouraged democracy on a world scale. But to be successful as democracies, developing countries must first become self-sufficient in food production so that they have a reliable source of adequate nutrition. Nobel laureate Norman Borlaug often has referred to agriculture as "the engine of change" for developing countries, asserting that the establishment of a reliable, cost-effective agricultural base drives social and economic development. Self-sufficiency in food is almost always the only practical, effective answer to poverty and recurrent hunger; subsistence societies do not have the money to import food, and foreign food aid is always temporary.

In addition to needing more food, people in developing countries need food higher in vitamins, minerals and other nutrients than traditional staples, like rice and cassava. Today, agricultural research is working to produce genetically modified crops that will provide greater quantities of these essential nutrients. Such advances will significantly improve the health of millions, particularly that of pregnant women, lactating mothers and their children.

Research to increase yield per acre remains important to eliminate the need to cultivate marginal land, which will help to relieve some of the pressure on the rainforests. Currently, the tons per acre yield in Africa is only one sixth that of the United States. Research is also needed to alleviate other effects of intensive agriculture, such as soil salinization and the erosion of top soil. Still other research is focused on providing crops with natural resistance to insects and disease, which will reduce the use of chemicals and increase yields. For example, cassava seedlings, genetically engineered to resist cassava mosaic virus, are currently being field-tested in Kenya. The availability of these novel cassava plants may significantly increase yields throughout rural Africa and provide people with a more stable, environmentally sustainable food source.

Unless agricultural research provides the developing world with seeds and technology that can be used locally to produce a steady, abundant supply of nutritious food, we can expect to see a significant increase in world hunger, retarded physical and intellectual growth, diseases, migrations, war and terrorism.

Chapter 4

ELEMENTS NECESSARY FOR THE SUCCESS OF NIFA

RECOMMENDATION: The Task Force recommends that NIFA have the following key elements that will differentiate it from other programs of the USDA and help ensure its success. Each is, in our view, an essential part of the whole.

1. The Institute will focus on fundamental scientific research related to its mission.

We recommend that NIFA focus on fundamental research that will deepen understanding of life processes; thereby, helping to assure that the nation's needs are met. We also recommend that the Institute fund a wide variety of fundamental research projects in the life sciences that will forward its mission. The Institute's scientific findings should be public and freely available to all.

In setting priorities, NIFA should, while keeping current needs in mind, maintain a long-term view. Most important research breakthroughs, such has hybrid corn and the "Green Revolution," were based on knowledge built over years of patient observation and experimentation. Similarly, the advances of future years will grow from the knowledge gained today and tomorrow.

We envision NIFA as a source of fundamental research, which, when joined with the existing programs of the USDA, land grant institutions, farmers, agri-business, environmental organizations, and consumer groups, will greatly enhance the effectiveness and public benefit of agricultural research.

2. NIFA will be a grant-making agency only.

Scientists from any field, including those who work in federal, state or local government agencies, universities and colleges, research institutes, and others whose proposals would benefit agriculture, will be encouraged to apply for support from NIFA. NIFA will not support a research staff of its own.

The recommendation that NIFA be a grant-making agency only is based, once again, on our model institutions, NIH and NSF. In 2002, about 85 percent of the NIH research budget and about 90 percent of the NSF research budget was distributed to areas of highest priority on a competitive basis, while, in the same year, only 8.5 percent of USDA research dollars were allocated to the merit-review competitive process. By concentrating the majority of their research funds in the competitive grant-making area, NIH and NSF help ensure that the science they support is the best and most effective available.[xvii] Fundamental agricultural research should be supported in the same way.

NIFA's program of competitive grants will encourage the nation's most able scientists to submit research proposals designed to produce the fundamental knowledge needed to improve food and agriculture; only the best of those proposals will be funded. Once funded, each grant will be subjected to periodic review to assess an investigator's scientific progress. When the original grant expires, investigators will be required to submit renewal proposals, which will be judged against both new and renewal proposals from other scientists. As a result, NIFA will not be committed to any single project or group of people; instead, it will be able to terminate ineffective programs easily and reallocate its resources as the nation's needs evolve.

By focusing solely on a competitive grant system that encourages fundamental research in the agricultural sciences, NIFA will augment the existing strengths of the USDA's in-house research. For instance, the USDA's experimental research stations, which are located in different parts of the country with different climatic and soil conditions, will be essential for turning NIFA-funded discoveries into practical applications. Also, Agricultural Research Service (ARS) staff will continue to collect and maintain valuable national resources, such as data bases and special genetic reservoirs.

3. **NIFA should be administratively separate and report directly to the Secretary of Agriculture.**

NIFA should be administratively separate from the USDA's agency of Research, Education and Economics (REE). We consider this recommendation key to NIFA's success. What is needed is a totally new culture and a different approach to setting priorities and making decisions. The traditions of the USDA and its methods of managing are very well-established and have

produced results in the past. Melding a new and different approach into existing programs seems to us an impossible task.

4. The Director of NIFA will be a distinguished scientist appointed by the President and confirmed by the Senate.

NIFA's Director should be a distinguished scientist who is trusted and respected by fellow scientists, by the administration, and by the Congress. NIFA's Director must have a broad and deep understanding of science, scientists, and the challenges facing the nation in food and agriculture. The Director of NIFA will report to the Secretary of Agriculture.

Because we are recommending a new endeavor that must be created and nurtured with both vision and care, we believe the selection of the first director will be especially critical. We believe that a presidential appointment is important for attracting an individual of the highest caliber.

We recommend that the director of NIFA serve for a single six-year term.

5. The Director will be supported by a Senior Staff.

A staff of highly accomplished scientists will assist the Director. Senior staff members will be recruited from the active scientific community. Many of these scientists should have rotating appointments similar to the model used by NSF. Such a system assures a steady influx of program officers familiar with the latest and most advanced science.

6. Standing Scientific Committees will assure high quality science through rigorous merit review.

Standing committees of highly qualified non-federal scientists will be appointed for four-year staggered terms. *Ad hoc* reviewers will supplement the standing committees when grants are submitted that require specialized knowledge not represented on the regular committees. All proposals not passing scientific muster will be declined. All that do pass scientific review will

receive a score based on scientific merit. The approved proposals along with their scores will then be passed on to the Council of Advisors for final review (see below). We recommend using only outstanding non-federal scientists on both the merit review committee and on the Council as part of the effort to create a new culture.

NIFA's ability to fulfill its mission to pursue fundamental science of the highest caliber – science with the potential to provide important benefits for our country – depends on stringent merit review. For more on merit review, see Chapter 5.

7. A Standing Council of Advisors will assure the relevance and importance of the science.

Though merit review by highly qualified scientists is an essential part of a successful research program, merit review alone is not sufficient to guarantee the importance of the work for meeting national needs; therefore, the Task Force recommends that a Standing Council of Advisors, composed both of scientists and stakeholders, be formed to help NIFA set its research priorities and debate and judge the relevance of its programs. The Council will also review all proposals passed by the scientific committees to ensure that the needs of the nation are being met. This recommendation is modeled after the NIH Councils.

The members of the Council should be highly qualified non-federal scientists and distinguished members of the American public, including representatives of farm organizations and industry, and persons knowledgeable about the environment, subsistence agriculture, energy, and human health and disease. We consider face-to-face meetings between scientists and stakeholders to be important to the success of NIFA. The Council will provide an important interface between scientists and stakeholders that will enable NIFA to link national goals and realistic scientific opportunities.

We recommend that members of the Council be appointed to four-year staggered terms by the Secretary of Agriculture, with the advice and consent of NIFA's Director.

8. **By virtue of the informational needs that will be placed on the Director and the Standing Council of Advisors, three offices of modest size should be formed to assist them. These offices will assure that the research NIFA funds is the most effective possible in both the short- and long-term.**

   The three offices are:

   - **An Office of Advanced Science and Application, which will closely monitor both national needs and advances in research with the goal of identifying pressing problems for which solutions are realistically achievable by research.**

     This office is designed to bring creative talent together from diverse disciplines to bridge potential gaps between fundamental science and high-priority practical needs. Its purpose will be to recommend paths to bring existing fundamental research to bear on the most pressing problems. This office should be organized as follows:

     - It should employ a small, focused staff of rotating experts in science and agriculture.
     - Key staff should be drawn from the ranks of active scientists who should serve no more than three years in order to assure that NIFA benefits from a steady supply of fresh ideas and new scientific insights.
     - Work should focus on a limited number of the most urgent problems. When required, the Office will assemble intensive study groups who will work for a month or more on urgent problems.
     - The Office should make regular reports to the Director of NIFA and to the Standing Council of Advisors and, when appropriate, suggest new research priorities.

   - **An Office of Scientific Assessment and Liaison, which will monitor the effectiveness of NIFA's scientific expenditures and oversee the coordination of its research efforts with those of other research programs in the life sciences.**

     The goal of this office will be to assess the effectiveness of NIFA programs from two standpoints: First, the quality of the science will be evaluated using such tools as are readily available; second, the Office will evaluate the contributions of NIFA to the national research effort including how it collaborates and cooperates with other federal agencies. This office will also encourage cooperative approaches among various research agencies.

Since one scientist's work is highly interdependent on the work of other scientists, it makes sense to institutionalize this liaison function within NIFA instead of relying on *ad hoc* arrangements.

- **An Office of Scientific Personnel, which will work with scientific and agricultural experts to assess the numbers of scientists in agriculture and related fields and establish the number that are needed.**

  This office will generate data that will assist the Director and the Standing Council of Advisors in planning appropriate NIFA fellowship and training programs.

  The Director of NIFA should have responsibility for ascertaining the manpower needs of agricultural research in the areas supported by NIFA and, if asked, for other areas of food and agricultural research as well. He or she should work with the Standing Council of Advisors to plan programs that meet the needs of the future. Portable fellowships and training grants to institutions, or a combination of the two, could supplement the manpower needs.

Chapter 5

THE ARGUMENT FOR MERIT REVIEW BY QUALIFIED SCIENTISTS

RECOMMENDATION: NIFA's success depends on a reliable, well-established system of soliciting proposals for grants and then submitting each one to merit review by qualified scientists. All proposals, whether they are submitted by individuals or institutions, should go through this rigorous process.

Merit review of broadly solicited proposals is essential to the success of NIFA. The Task Force considers this process so important that we have devoted this chapter to the concept. The goal is to assure that NIFA receives proposals from any scientist with a promising idea, but funds only those that pass the quality standards of competent scientists.

We recommend this approach because we believe that the U.S. government should get the most for its expenditures. Decisions based on unexamined impressions or personal relationships can lead to unhelpful science and a waste of resources. We believe the government should support only that science that has a good chance of forwarding the federal agenda. By incorporating merit review as a key procedure, NIFA will provide the nation with the best science for the investment.

In order to understand why we now call for a change, it is important to explain why we believe agricultural science is managed so differently from the science of the NIH and the NSF. Agricultural science is the oldest of the federal scientific programs. It has a glorious history and embedded traditions; it accounts for much of the innovation that has supplied the American people with food that is safe, nutritious and inexpensive. Agricultural science came of age when intelligent lay people could understand how it worked and how it led to innovations and improvements in farming. Partly because federal programs evolved in cooperation with state programs, decision-making was concentrated in the political arena. This method of decision-making was logical because politicians and groups representing farmers understood traditional agricultural science – they knew what they needed and wanted.

Traditional agricultural science also differs from science conducted by NIH and NSF because it is place-bound; that is, it differs from one region to another. The needs of those who grow cotton are

not the same as those who grow blueberries or those who raise chickens. Soil and climatic differences have determined the necessary research. So that it might be useful and quickly put into practice, the research has wisely been tied to extension programs. It made sense and still makes sense for politicians to defend the science that they believe is needed by their regions.

But the world changes. Importantly, the underlying science has evolved. The fundamental life sciences on which so much of the future depends are now more esoteric and further removed from the day-to-day experience of lay people. Thus, while traditional agricultural sciences are still necessary and important, the old methods of decision-making do not work well with the new sciences involving genetics, cell and molecular biology, and proteomics. These sciences are difficult to master. The lay person, even if exceptionally intelligent, can no longer judge the value of specific lines of research. Only scientists in similar or related fields can know whether the science is or is not likely to yield any useful answers. Nor are the fundamental sciences place-bound. The practical applications may be, but the underlying science is not. For example, understandings developed from a simple model plant such as Arabidopsis can be quickly applied to major food crops.

It is for these reasons that the traditional methods of managing and making decisions about agricultural sciences are not well-suited for handling the newer life sciences, such as plant and animal molecular biology. They are better handled by the wide solicitation of proposals that are then submitted to scientific review as outlined in earlier chapters.

Chapter 6

NIFA'S ROLE IN THE FEDERAL RESEARCH ENTERPRISE

RECOMMENDATION: NIFA should operate as a key part of the federal research enterprise conceived as a whole. More specifically it should supplement and enhance, not replace, the existing programs of the U. S. Department of Agriculture, the National Science Foundation, and the National Institutes of Health.

As we envision it, NIFA will operate as a key part of the federal research enterprise, conceived as a whole. Though it will be independent, NIFA will be complementary to all current federal research programs, in particular the USDA (for example, the Agriculture Research Service; the Animal and Plant Health Inspection Service; the Cooperative State Research, Education, and Extension Service; the Economic Research Service; the Food Safety and Inspection Service; the National Agricultural Statistics Service; and the Natural Resources Conservation Service), to help provide the fundamental science necessary for their work. In addition, NIFA will complement and augment the important work of the Biological Sciences Directorate of the NSF that is responsible for understanding the genomes of plants and microorganisms; the NIH that is concerned with overall human health, including food and nutrition; the Department of Energy that is interested in improved methods for producing fuels and other new bio-based products; the Centers for Disease Control that are involved in food safety; the Department of Homeland Security that is charged with defending our food supply against terrorist attacks; the Environmental Protection Agency that looks out for the environment; the United States Agency for International Development that addresses ways to reduce hunger and malnutrition in developing countries; and the Department of Commerce that works to improve foreign trade. It is important to note that none of these agencies can do an effective job without a constant flow of information and new ideas from research in food and agriculture. Similarly, agricultural research cannot proceed apace without benefiting from the work of other fields and agencies.

NIFA will play an important role in protecting the nation's health, economy and environment. It will provide the fundamental science base needed to serve farmers, consumers, environmentalists, and those concerned with the nation's economy and foreign policy. Its closest scientific relationship will likely be with the programs of the USDA, the NIH, and the NSF, but NIFA should also avail itself of the opportunities for collaborative work with other agencies as well.

We recommend this new Institute with full awareness of the USDA's significant past and present contributions to American agriculture. U.S. achievements in agricultural productivity have been called the "Miracle of American Agriculture."[xviii] It has been estimated that every dollar invested in agricultural research returned $3.50 to the American economy within a decade.[xix] For reasons such as these, the USDA should maintain its broad-based responsibility for managing the essential infrastructure of American agriculture.

Nonetheless, new challenges mentioned earlier and new opportunities arising from advances in the life sciences require new approaches. Federal and state governments have historically accepted the responsibility for maintaining the infrastructure necessary to sustain vital agricultural productivity. These investments have for decades included public support for USDA research, as well as for the Land Grant system of Colleges and Universities. Now is the time to add a new, modern element so as to improve upon past successes while addressing the challenges of the present and the future.

More specifically, NIFA will interrelate with the USDA, the life science components of the NSF, and the NIH in the following ways:

- **USDA**

  Agricultural Research Service (ARS) scientists, who are employees of the USDA, conduct both fundamental and applied research. Because NIFA will not perform research in-house and because all its funds will be used for fundamental research via a competitive review process, ARS scientists who perform fundamental research will be able to submit proposals to NIFA for funding, along with scientists from other organizations.

  In this way, NIFA will enhance the work of ARS by providing ARS scientists with an opportunity for additional funding, and by expanding the knowledge base on which they draw.

  Cooperative State Research, Education, and Extension Service (CSREES) programs of the USDA fund research conducted by non-USDA scientists. Most of the research funded by CSREES is oriented more toward the achievement of practical results rather than the pursuit of fundamental knowledge; therefore, the objectives of CSREES and NIFA do not conflict.

The program within CSREES that most resembles NIFA is the National Research Initiative (NRI), which receives and distributes only about 8.5 percent of the total USDA research budget. Historically, NRI grants have been small in number and in dollars per grant. In addition, overhead reimbursement to institutions that receive NRI grants is so low that many institutional leaders discourage their scientists from applying for them. As a result, many scientists interested in agriculture prefer projects that receive funding from NIH or NSF. Moreover, NRI does not have a Standing Council of Advisors that includes stakeholders and scientists, nor does it have the specific responsibility of relating fundamental research to practical needs.

It is important to note that NIFA cannot and will not replace the work carried out by ARS scientists across the nation nor will it duplicate the practical research and extension programs of land grant institutions. While NIFA will address issues that are basic to all plants and animals, it will not duplicate nor replace such ARS work as adapting fundamental discoveries to regional conditions, taking into account soil quality, climate, and the availability of water. Therefore, by providing additional support for fundamental research related to agriculture, NIFA will enhance current and future USDA research.

- **NSF**

  The NSF funds research in science and engineering. It has a very strong program in plant science that includes work on plant genomes. NIFA would not duplicate this work.

  Rather, NIFA will fund other fundamental research that is relevant to the needs of agriculture – a focus that will result in different, but complementary, priorities for the two organizations. While NSF works to learn more about the basic science of plants, NIFA will work to learn more about plants and animals as they relate to agriculture. Research funded by NIFA will complement the science funded by NSF and make that research more relevant to agriculture. The NIH and the Biological Sciences Directorate of the NSF – two agencies whose work has complemented each other very well – divide their research priorities in a similar way.

- **NIH**

  The NIH funds fundamental and applied research related to health. NIFA will fund fundamental research related to agriculture, and ARS and university scientists will apply the results of NIFA research to create practical agricultural advances.

  Despite this division of responsibilities, there are many opportunities for joint or collaborative work between NIFA and NIH scientists on important health issues, including obesity, diabetes, animal to human transmission of diseases, food safety, and special diets for individual health needs. Because both concentrate on the life sciences, there are many opportunities for cross-fertilization, such as the exchange of information concerning the methods various pathogens use to infect plants, farm animals and humans.

Chapter 7
THE BUDGET

RECOMMENDATION: NIFA's budget should build to approximately $1 billion over a five-year period.

NIFA's budget is designed to accomplish the following goals:

- To provide sufficient funds over a long enough period of time to accomplish important work that helps address and solve a variety of challenges discussed elsewhere in this report.
- To encourage outstanding scientific talent, wherever that talent may be, to work on issues important to agriculture.
- To adequately reimburse grant-receiving institutions for their costs so that deans and presidents will encourage scientists to pursue agriculturally related research.

To achieve these goals, we recommend that there be:

- Project Grants (Grants awarded to one or more principal investigators)
    - NIFA should award 1,000 research project grants annually. This number should be sufficient to attract the attention of the scientific community and to add significantly to the number of scientists engaged in agricultural research.
    - The average grant size, including overhead, should be $225,000 per grant year. These grants would be larger than those awarded by NSF, but not so large as those awarded by NIH. We believe the recommended average size of a NIFA grant will be sufficient to attract qualified scientists and to fund important work.
    - NIFA grants should be awarded for a maximum of five years, with an average award duration of 3.5 years. Appropriate annual reports should be required for each award. Training grants will be provided as the need arises.

- Multi-disciplinary Research Center Grants (Grants awarded to a number of collaborating investigators)
    - Beginning in Year Two, NIFA should award 10 research center grants until there are a total of 40 funded research centers. These centers may be single or multi-institutional.

- Research center awards should average $3 million annually for five years.
- Assuming there are adequate proposals, research center grants should represent about 15 percent of NIFA's total research dollars. Merit review by qualified experts will insure that only quality proposals are funded.
- Research center grants from NIFA should fund coordinated cross-disciplinary research programs, an approach NIH and NSF have found very useful in advancing science.

- Indirect Costs (Overhead)
  - The overhead paid to institutions as part of a NIFA grant should be the same as the standard negotiated rates that now apply to NIH and NSF grants rather than the current artificially low rates associated with USDA research grants.

- NIFA Management Costs
  - We assume that NIFA's management costs will represent 5 percent of the total budget when the Institute is fully operational. This is the same percentage as NSF.
  - We assume that the management costs will be a higher percent of the total budget in the early years.

Though actual budgets need to be worked out with great care, and defended, we have provided budget estimates below that would fund a strong NIFA:

Model Budget Year 1	
Project Grants:	$225 million
Management Costs:	20 million
TOTAL:	**$245 million**

Model Budget Year 2	
Project Grants:	$450 million
Center Grants	30 million
Management Costs:	35 million
TOTAL:	**$515 million**

Model Budget Year 3	
Project Grants:	$675 million
Center Grants	60 million
Management Costs:	45 million
TOTAL:	**$780 million**

Model Budget Year 4

Project Grants:	$800 million
Center Grants	90 million
Management Costs:	45 million
TOTAL:	**$935 million**

Model Budget Year 5

Project Grants:	$800 million
Center Grants:	120 million
Management Costs:	46 million
TOTAL:	**$966 million**

Notes: History and Comparative Data

Appendix 3, which compares the size of USDA grants to those of NIH and NSF, demonstrates why agricultural research has not attracted enough leading scientists from outside the USDA. Appendix 3 also shows that growth in research funding available to the USDA has lagged behind the growth of all other federal non-defense research and development over a 20-year period (0.7 percent average annual growth compared to 2.75 percent.) Comparisons with other agencies are also shown.

Chapter 8
LEGISLATIVE RECOMMENDATIONS

RECOMMENDATION: We recommend the creation of NIFA. Its working relationship with Congress should be similar to that of the NIH and NSF. To establish credibility with Congress, NIFA will have a new approach to setting priorities and making decisions with the goal of ensuring scientific and programmatic excellence.

- **NIFA should have independence within the USDA so that it can establish its own culture of scientific excellence and innovation.**
- **If NIFA is to succeed, Congress must provide new funding that is stable enough to support well-conceived research projects; moreover, Congress must give NIFA clear responsibility for overseeing and managing scientific judgments.**

The above recommendation is made with the following points in mind:

1. **Managing and funding modern biological research is a very different job from managing and funding traditional agricultural programs and research.**

   To be effective, management and funding of fundamental research requires a different kind of partnership with the science community than that which has worked for traditional agricultural research. Funding decisions concerning NIFA must take the assessments of knowledgeable scientists into account, not to set governmental policy but to judge the value of science and to weed out applications that are neither scientifically sound nor of high enough scientific quality. In more traditional areas of agricultural research funding, regional needs and priorities are well understood and logically affect legislation. On the other hand, fundamental research, by its very nature, serves the nation as a whole and provides the knowledge base for solving agricultural issues in general, and, therefore, requires a different approach to scientific decision-making.

2. **History warns that the necessary changes will not be easy. Competitive, merit-review grants open to all have not fared well in the agriculture appropriations sub-committees despite past recommendations, yet these types of grants have been shown by both NIH and NSF to be the most effective way of attracting American scientists to important fields of study.**

   Since 1972, numerous reports by the National Research Council have recommended ways to restructure agricultural research for the modern era (See Chapter 9 and Appendix 4), yet these

reports have had little impact. The traditions of funding agricultural research are well established. Innovations, such as the National Research Initiative, have not been funded with sufficient resources to do the necessary job. In addition, NRI grants have been hampered by limitations on the size and length of grants and by artificially low overhead allowances.

3. **There are two important keys to the success of NIFA: A new and stable funding stream and a relationship of trust with Congress so that scientists decide scientific matters.**

To achieve these goals, new funding should come through an appropriations subcommittee, such as the one that funds the VA, HUD and independent agencies, because of that group's experience in handling a major research agency, or through the Agricultural Appropriations Subcommittee if the members wish to embrace a new approach to supporting science.

Chapter 9

WHY A NEW INSTITUTE IS NECESSARY NOW

For decades the United States has led the world in agricultural innovations and in agricultural production, thanks in large part to the leadership of the USDA. Yet, as noted in earlier chapters, American agriculture must now surmount many new challenges, for example, increasingly efficient foreign producers, rising concerns about food safety, the need to preserve the environment, American dependence on foreign sources of petroleum, and other concerns described earlier. Fortunately, today's challenges can be met by applying fundamental life science to agriculture.

This Task Force concludes, along with a number of experts we consulted and with the prior groups that have examined this issue, that America is not optimally exploiting current scientific opportunities to speed agricultural innovation. It is not hard to describe what should be done to develop the necessary scientific base, for in similar life science arenas, the NIH and the NSF have already shown the way. We need to develop a well-financed program, invite the nation's leading scientific talent to propose research that will address important agriculturally related issues, and, finally, select the best proposals for funding by relying on competitive scientific and programmatic review.

Unfortunately, despite the recommendations of very good reports dating back to 1972, there has been little change in the pattern of Congressional funding or the USDA's management of agricultural research. For example, our recommendations track closely an important recommendation from the 1972 report: (See also Appendix 4.)

> "Recommendation
> That the USDA seek a greatly increased level of appropriations for a competitive grants program, which should include support of basic research in the sciences...that underpin the USDA mission...[Grants] should be available to scientists in the USDA, in land-grant and non land-grant public universities or colleges and in private universities or colleges, institutes, and other agencies. The Committee recommends that this program be administered in such a way that research proposals are subjected to evaluation by peer panels of selected scientists...and that the administration should not be the same as that making allocations for USDA in-house research" (1972: p.49). Emphasis in the original.

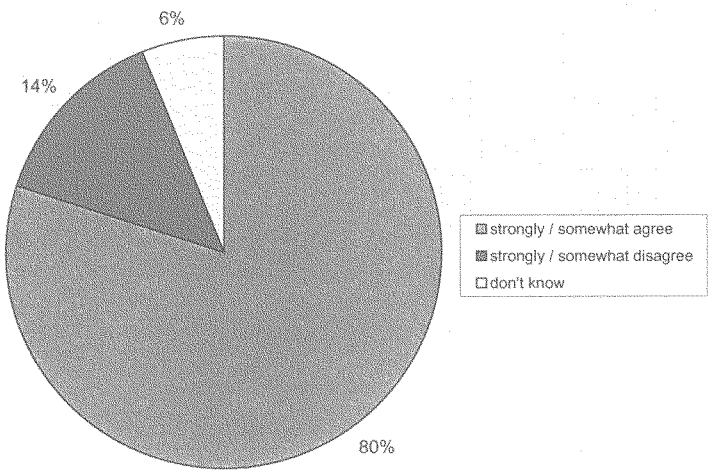
Due in part to subsequent inaction, there has been a loss of confidence in the research sponsored by the USDA. A majority of those with whom we have consulted believe that the monies appropriated for agricultural research have not been spent as well as they should be. Whether one thinks these views are valid or not, the results are evident. Appropriations for agricultural research have grown little in constant dollars in the last 20 years despite the increase in both need and in opportunity. In turn, low levels of funding have delayed scientific progress and further eroded the reputation of agricultural research.

Yet, the need for fundamental research grows every day. Opportunities for progress have been lost. America cannot wait to be surpassed by other countries that use less expensive labor to make effective use of past American innovations, to deplete our supplies of fresh water, or be struck by bioterrorism.

More than 30 years have passed since the 1972 report. We are alarmed that so little progress has been made. We are convinced that – for the good of the nation – action must be taken now. We have faith that America's response will be appropriate.

Figure 1

Public Support for Basic Research
Even if it brings no immediate benefits, basic science research, which advances the frontiers of knowledge, is necessary and should be supported by the federal government.



Source: "Taking our Pulse: The Parade/Research!America Health Poll" conducted by Charlton Research Company, 2004

APPENDIX 1: Vision Statement

If the United States is to meet the current and future challenges of agricultural research, the agriculture of 2024 must be vastly different from today. We envision that higher productivity per acre will have lowered costs and improved American competitiveness, while, at the same time, agricultural incursions into forests, wetlands and outdoor recreational space will have been lessened. A steady flow of innovations will have provided American farmers and consumers with new and specialized products designed to be competitive in the marketplace. Rural areas will have had opportunities to create jobs and capture economic gains from these new products. Americans will be eating more nutritious foods with higher quality proteins and vitamins, and special foods will be available for individualized needs. Collaboration between agricultural and medical scientists will have contributed to reduced obesity through the development of satisfying foods that have fewer calories. The food supply will be much safer than it is today, with effective vigilance against bioterrorism.

There will be new strategies to increase resistance to disease in plants and animals, and a deeper understanding of how to prevent transmission of disease from animals to humans. New bio-based products will have been developed from plants and animals, including new renewable fibers with differing desirable qualities, low-cost pharmaceuticals and vaccines, and fuels from biomass that bring the hope for "green energy" to life. Great advances will have been made toward the production of hydrogen from sunlight. The environment will be enhanced by limiting water, pesticide and fertilizer inputs. Agriculture will be more sustainable, and it will no longer drain aquifers, deplete the topsoil, or pollute rivers and oceans. The nation will be well on the way to using renewable resources in ways that can be sustained generation after generation. Finally, new and improved crops will be available to combat hunger in developing nations.

We believe that our vision is realistically obtainable. It will succeed by attracting the most creative scientific minds to agricultural research that are necessary for creating the knowledge to improve agriculture. Because agriculture is a life science, all of the work already accomplished in understanding the biology of viruses, bacteria, animals and humans is relevant and can be applied to agricultural research.

While we are hopeful and optimistic, we are also very aware of the challenges facing American agriculture and all Americans if nothing is done. We fear that maintaining the *status quo* will result in a loss of competitiveness for American agricultural products in the national and international marketplaces, a continuing erosion of our environment, and a food supply that will be increasingly at risk.

APPENDIX 2: Public and Private Funding of Agricultural Research and Development

An understanding of the responsibilities of the federal government, the states and the private sector in performing and funding agricultural R&D is important. These issues are presented in a thoughtful and helpful way in a paper by Keith Foglie, *et al,* for the Economic Research Service of the USDA. (AER-735)

Briefly, private R&D is commercially oriented. Companies, which must hold down costs, concentrate R&D funds on research that is likely to result in sales and profits, preferably on research that will lead to intellectual property that can be protected by patents. They are little interested in research that will benefit their competitors. For example, more than 40 percent of private agricultural R&D budgets is invested in product development, compared with less than 7 percent in public agricultural research. (AER-735) The directions of agricultural research performed by industry are shown in Figure 1.

Industry, federal and state funding for agricultural research

The traditional role of the federal government has been to support research that would not normally be funded by private industry because:

1. The knowledge produced is available to all and, therefore, is not proprietary, or
2. The new knowledge is in areas that have no profit potential, such as deeper understanding of environmental impact and more nutritious crops for subsistence farmers, or
3. The time and effort needed to develop new knowledge is too long for the time horizon of a commercial venture.

In general, most fundamental research falls into one or more of these categories.

The states, which have long partnered with the federal government in support of agricultural research, have incentives to invest in research that will benefit producers of that state. This type of research tends to be more downstream and applied rather than fundamental. Consequently, there are appropriate roles for all three historic partners.

Figure 2 (from AER-735) shows the flow of funds in the three sectors in 1992.

Trends in funding agriculture R&D

In recent years, public funding has been decreasing in constant dollars as a result of lack of growth in federal funds and tight state budgets. Private funding has grown dramatically, and by 1997 it outpaced public funding by $1.3 billion ($4.5 billion versus $3.2 billion). See "The Seed Industry in US Agriculture" by Jorge Fernandez-Cornejo, USDA/ERS, Jan 2004. As a comparison, the USDA spent only $1.74 billion in 1997.

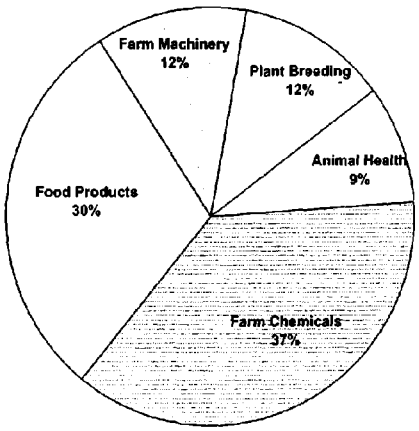
Comparison with health R&D

We believe that there are parallels between agriculture research conducted by the USDA and agri-business, and health research, conducted by NIH and the pharmaceutical companies. In both cases, government and corporate research function best when each plays a different, but synergistic, role.

According to a news release issued by the Pharmaceutical Research and Manufacturer's Association (PhRMA), its member companies invested an estimated $33.2 billion "in discovering and developing new medicines" in 2003. That same year, the NIH spent over $23 billion. Data on state expenditures are not available. One can calculate from the above information, however, that the percentage of federal to private expenditures in health is 0.69, while in agriculture, it is only 0.39. We argue that the science and the use of science is similar in the health and agricultural fields and should be funded similarly.

Figure 2

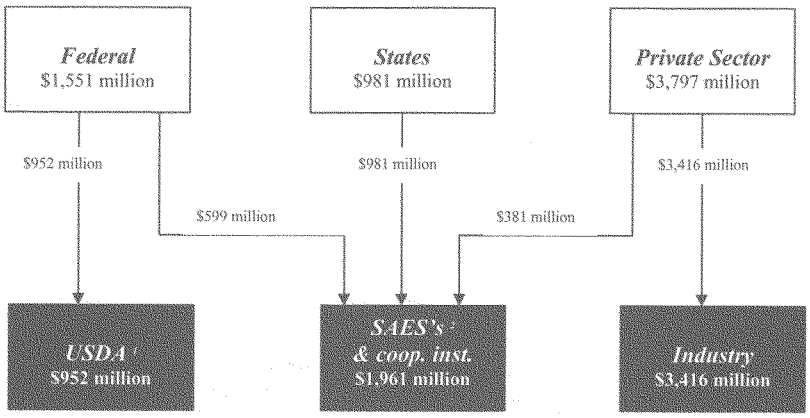
Private agricultural research by industry



Source: Economic Research Service. Data derived from Klotz, Fuglie, and Pray (1995).

Figure 3

Sources and flows of funding for agricultural research in 1992



[1] Includes research by Agricultural Research Service, Forest Service, Economic Research Service and National Agricultural Library.

[2] SAES's are State agricultural experiment stations; coop. instit. include the 1890 schools, forestry schools and veterinary schools.

Sources: Economic Research Service. Data for Federal and State research expenditures derived from the USDA, Inventory of Current Research; data for private sector/industry research expenditures estimated from Klotz, Fuglie and Pray (1995).

APPENDIX 3: Comparative Information

1. For 20 years, the research budget of the USDA has:

   a. Lagged behind the research budgets of NIH, NSF and NASA. Figure 1 shows the cumulative growth of R&D funding for the four agencies.

   b. Lagged behind the growth of all federal non-defense research and development. See Figure 2.

   c. Barely kept ahead of inflation during a time when both opportunities and challenges have grown dramatically. Since 1983, the average annual increase (based on constant 2000 dollars) at each agency has been:
   NIH: 5.73%
   NASA: 3.17%
   NSF: 2.43%
   USDA: 0.70%
   Non-Defense R&D overall: 2.75%

2. Individual grants through USDA are small compared with other federal grants (Table 1), a situation that discourages scientists from applying and prompts them to do research that can be funded by NIH or NSF. As a result, excellent scientists are enticed away from problems of special interest to agriculture.

3. Low overhead reimbursement makes the grants expensive to the scientists' institutions, causing many institutional leaders to discourage their scientists from applying to USDA, thus making it less likely that the research will be performed by our best and brightest scientists.

Figure 4

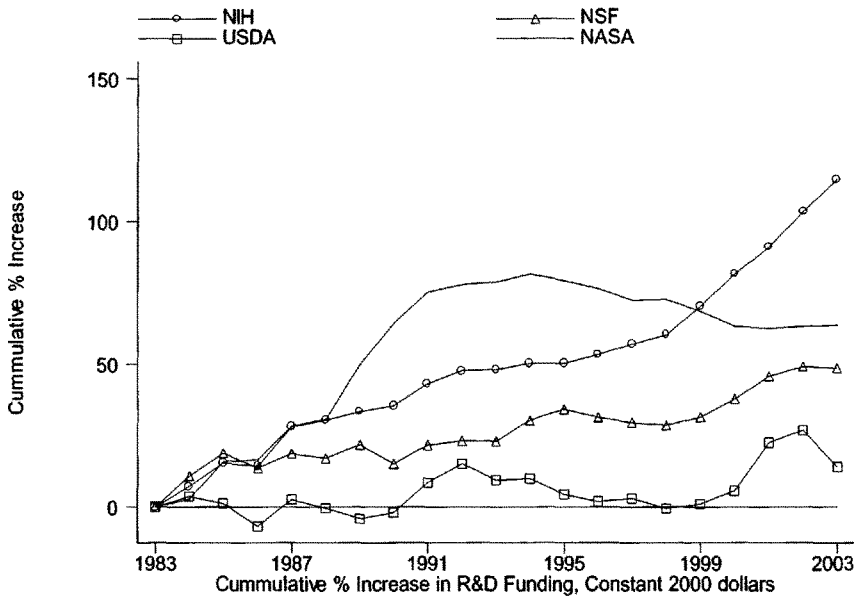

NIH
NSF
USDA
NASA
150
100
50
0
Cummulative % Increase
1983
1987
1991
1995
1999
2003
Cummulative % Increase in R&D Funding, Constant 2000 dollars

Figure 5

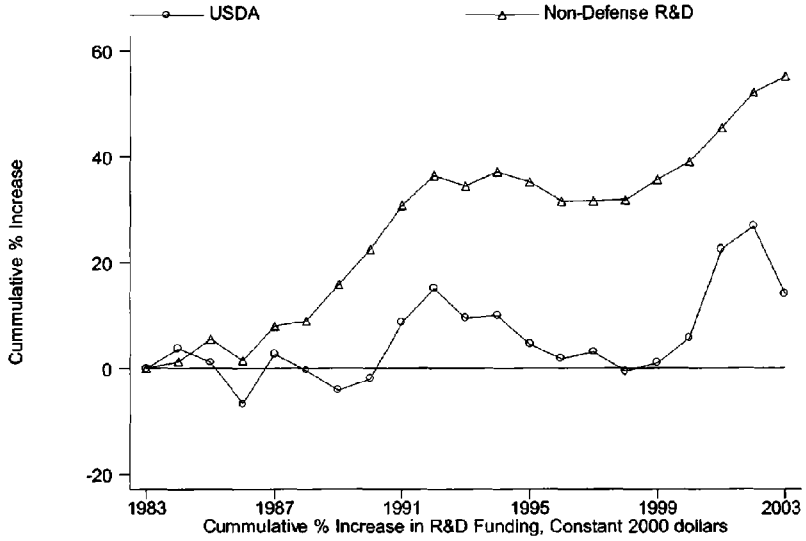

USDA
Non-Defense R&D
60
40
20
0
-20
Cummulative % Increase
1983
1987
1991
1995
1999
2003
Cummulative % Increase in R&D Funding, Constant 2000 dollars

Table 1: FY 2001 Competitive Grant Awards – NIH, NSF & USDA

Agency	Total Award Spending (Millions)	Number of Awards	Average Total Grant Award[1]	Average Duration	Average Annual Award	Median Annual Amount
NIH						
Competitive External Grants (all types)	$16,784.7	46,845	$1,289,890	3.60 yrs	$358,303	na
Research Projects – type R01	$8,092.6	26,173	unk	unk	$309,196	na
NSF						
Competitive Grant Awards	$3,342.6	20,932	$329,443	2.9 yrs	$113,601	$84,612
Division: Biological Sciences	$486.0	3,456	$443,923	3.1 yrs	$143,201	$108,333
USDA – CSREES						
National Research Initiative	$97.4	597	$188,116	2.4 yrs	$78,382	na
Program: Animals	$19.5	90	$216,564	2.5 yrs	$87,994	$86,000
Program: Plants	$10.5	69	$151,987	2.2 yrs	$74,168	$70,461
Higher and Longer Term Awards						
NSF						
Special Competition Awards	$137.2	85	$1,613,686	3.5 yrs	$461,053	$243,877
USDA[2]						
Initiative for Future Agriculture & Food Systems	$115.4	98	$1,177,084	2.9 yrs	$405,891	$314,138

Notes:

[1] This figure is derived from the data listed in the reports cited below. For NIH and NSF, it is the Average Annual Award times the Average Duration. The USDA *NRI Annual Report* provides the NRI's average award; the program averages were calculated based on the abstracts of funded research.

[2] The IFAFS program was created in 1998 to examine critical emerging agricultural issues such as: future food production, food safety, environmental quality, natural resource management, and farm income. The program's funding has been blocked by the House Appropriations Committee since 2001. As a result, USDA is no longer accepting proposals under this program.

Sources:

NIH

Total Award Spending (total cost obligations), Number of Awards: http://grants1.nih.gov/grants/award/trends/fund9202.htm
Average Total Cost: http://grants1.nih.gov/grants/award/trends/avgawdsrgcurrcon9702.htm
Average duration: http://grants1.nih.gov/grants/award/research/avglen01.htm

NSF

Competitive Grant Awards: Summary of FY 2003 Budget Request to Congress (contains revised figures for FY 2001). http://www.nsf.gov/bfa/bud/fy2003/profile
Division of Biological Sciences: Summary of FY 2003 Budget Request to Congress (contains revised figures for FY 2001) http://www.nsf.gov/bfa/bud/fy2003/nar_bio.htm
Special Competition Awards: FY 2001 Abstracts of Funded Awards, available at: http://www.nsf.gov/bio/award.htm

USDA

NRI: FY2001 Annual Report, and FY 2001 Abstracts, available at: http://www.reeusda.gov/nri/pubs/annreport/2001.pdf; http://www.reeusda.gov/nri/pubs/abstracts/programlinks01.htm
IFAFS: FY 2001 Abstracts, available at: http://www.reeusda.gov/ifafs/

Table 2: Total R&D by Agency, 1973-2003
(Constant 2000 Dollars in Billions)

Year	NIH	NSF	USDA	NASA	DOE	DOD
1976	7.35	2.17	1.68	11.46	9.96	32.69
1977	7.64	2.23	1.67	11.68	12.78	35.32
1978	8.14	2.26	1.81	11.57	14.48	34.22
1979	8.48	2.21	1.88	12.00	14.32	34.10
1980	8.11	2.15	1.68	12.34	13.57	32.99
1981	7.64	2.05	1.75	11.83	13.18	37.18
1982	7.44	1.96	1.67	9.23	10.88	41.95
1983	7.87	2.06	1.72	5.31	10.03	45.97
1984	8.44	2.28	1.78	5.46	10.29	50.98
1985	9.13	2.46	1.74	6.17	10.36	55.42
1986	9.02	2.33	1.60	6.21	9.23	58.33
1987	10.26	2.45	1.75	6.94	8.69	59.51
1988	10.50	2.41	1.70	7.11	8.83	57.85
1989	10.82	2.52	1.63	8.48	8.96	55.27
1990	11.05	2.36	1.67	9.69	9.52	51.59
1991	11.89	2.51	1.84	10.76	9.72	49.28
1992	12.43	2.55	1.96	11.04	10.51	48.81
1993	12.49	2.54	1.85	11.13	9.40	49.05
1994	12.76	2.73	1.86	11.46	8.25	43.25
1995	12.74	2.84	1.76	11.19	7.59	41.83
1996	13.16	2.76	1.71	10.87	7.23	41.22
1997	13.62	2.70	1.74	10.43	6.93	41.51
1998	14.05	2.68	1.67	10.45	6.81	40.27
1999	15.48	2.76	1.70	10.03	7.19	40.13
2000	17.23	2.93	1.78	9.49	6.96	39.96
2001	18.86	3.16	2.08	9.42	7.37	40.71
2002	21.15	3.27	2.17	9.49	7.76	46.05
2003	23.58	3.25	1.89	9.52	7.42	48.87

Source: American Association for the Advancement of Science (AAAS) Reports I – XXVI, based on OMB and agency budget data as reported in National Research Council 2003, Table F-2; deflator F-11

APPENDIX 4: A Summary of Past Reports

A large number of prior reports have underscored the importance of research in agriculture and the need to improve how it is carried out. Given the Task Force's current mandate, five prior reports and one academic article seem most relevant.

The five reports, all produced by the National Academy of Sciences (NAS), are: 1) Report of the Committee on Research Advisory to the U.S. Department of Agriculture (1972); 2) Investing in Research: A Proposal to Strengthen the Agricultural, Food, and Environmental System (1989); 3) National Research Initiative: A Vital Grants Program in Food, Fiber, and Natural-Resources Research (2000); 4) Publicly Funded Agricultural Research and the Changing Structure of U.S. Agriculture (2002); and 5) Frontiers in Agriculture Research: Food, Health, Environment, and Communities (2003). The article, "The Agricultural Grants Program," (1981) was published in the journal Science.

The reports summarized below clearly indicate that the need for a well-funded and effective competitive grants program has been evident for at least 30 years.

Reports

1. *Report of the Committee on Research Advisory to the U.S. Department of Agriculture (1972)*
   This report by a distinguished panel of the National Academy of Sciences took note of the challenges to American agriculture and the state of agricultural research. Excerpts follow:

   "The practice of agriculture has long outgrown the individual farmer and his art…It requires research, policy and programs sufficient to challenge the best efforts and minds of America."

   "[The Committee] has found many programs of excellence…Acknowledgement must also be made of findings that indicate that much of agricultural research is outmoded, pedestrian, and inefficient, and that bold moves are called for in reshaping administrative philosophies and organizations, in establishing goals and missions, in training and management of research scientists, and in allocation of resources."

   "…grossly inadequate support was given to the basic sciences that underpin agriculture…"

   "It is not sufficient for the programs of agricultural research to be directed only to the pressing needs of the hour…there must be information generated with which the pressing needs of future generations will be met."

   "Recommendation
   That the USDA seek a greatly increased level of appropriations for a competitive grants program, which should include support of basic research in the sciences…that underpin the USDA mission…[Grants] should be available to scientists in the USDA, in land-grant and non land-grant public universities or colleges and in private universities or colleges, institutes, and other agencies. The Committee recommends that this program be administered in such a way that research proposals are subjected to evaluation by peer panels of selected scientists…and that the administration should not be the same as that making allocations for USDA in-house research." (Underline present in original report.)

2. *Investing in Research: A Proposal to Strengthen the Agricultural, Food, and Environmental System (1989)*
   This document from the National Research Council (NRC) reports that in the areas of nutrition, international trade, natural resource conservation, and control of pollutants, the problems confronting agriculture are compounding more rapidly than they ever have in the past. The report finds that "Solving the problems . . . will require much more new knowledge than was required to solve previous problems." (p. 2)

   The report states "U.S. farmers cannot compete with the price of labor in many countries, where it is far lower than in the United States. And, for the same reason, they cannot compete with the cost of fertile land in other countries. The single resource U.S. farmers can draw upon to capture the leading edge is science and technology." (p. 9)

   To promote solutions to the above problems, the report makes a number of suggestions. The most important are: 1) The amount of money allocated to agricultural research should be dramatically increased. 2) The best way to improve agricultural research is to fund it through competitive grants, i.e., peer-reviewed science.

3. *National Research Initiative: A Vital Grants Program in Food, Fiber, and Natural-Resources Research (2000)*
   The purpose of this study was to evaluate the national research initiative. The report found that many new opportunities and challenges confront agricultural research.

   At the time the report was written (2000), USDA spent about $1.7 billion a year on research. Of this, only $120 million was spent on competitive grants. The remainder of the $1.6 billion that USDA spent on research was "distributed non-competitively through intramural research grants to USDA staff, formula funds to state agricultural experiment stations, and special grants for targeted initiatives and direct grants to states." (p. 2) The report states that such practices are at odds with the way most publicly supported research is funded, and it asserts that "merit-based peer-reviewed research . . . could have profoundly beneficial effects in the United States and the rest of the world." (p. 2)

   The National Research Initiative (NRI) is seen as a pilot program that has garnered some success given its very limited resources. In fact, the committee found that the NRI is in decline because of the size of the program, the short duration of individual grants, and the low overhead allowance. The conclusion is that "the location of the NRI within the USDA organizational structure suggests that the USDA and Congress place a higher priority on formula funds, special grants, and intramural research than on extramural, merit-based peer-reviewed research." (p. 4)

   The committee makes a number of recommendations, including: 1) That high-risk research with potential long-term payoffs be undertaken. 2) That the distribution of all research funds be done through merit-based peer review. 3) That stakeholders be more engaged. 4) That priority-setting be improved. 5) That a new institutional structure is needed if merit-based peer-reviewed research is to flourish.

The executive summary of the report concludes with a dire warning for Congress and the American public. It states: "The food, fiber, and natural-resource system is too important and too fundamental to future national security and stability not to have its own research program that focuses explicitly on high-risk problems with potential long-term payoffs...Without a dramatically enhanced commitment to merit-based peer-reviewed food, fiber, and natural-resources research, the nation places itself at risk." (p.14)

4. *Publicly Funded Agricultural Research and the Changing Structure of U.S. Agriculture (2002)*
The mission of the committee that conducted this study was to "...examine whether publicly funded agricultural research has influenced the structure of U.S. agriculture..." (p. 2)

   Among the committee's findings are that: 1) "public-sector agricultural research is an important, but not an exclusive factor in structural change" (p. 5), and 2) "publicly funded research is important to the public good." (p. 7)

   The committee goes on to make a number of suggestions as to how agricultural research can be improved. They suggest that public-sector research be broadened beyond productivity and efficiency; that stakeholder needs and knowledge be incorporated into the research agenda; and finally that underserved populations also benefit from agricultural research.

5. *Frontiers in Agriculture Research: Food, Health, Environment, and Communities (2003)*
At the request of Congress, the NRC undertook "a study of the United States Department of Agriculture's (USDA) Research, Education and Economics (REE) mission area." (p. 1) They were also tasked with providing "recommendations for future opportunities and directions." (p. 1) In the report, the NRC finds that agricultural research is being transformed and that a new focus is needed.

   The committee felt many new challenges confront agricultural research, including the globalization of food production and its implications, the identification of emerging pathogens and other hazards in the food supply, nutrition and human health, protection of the environment, and the strengthening of rural communities.

   Because much of the benefits from this research, in particular that related to public health and the environment, are widely distributed, it is difficult for any private firm to capture the revenue that such benefits generate. Thus, the report concludes that research in such fields as public health and the environment will not be conducted unless it is undertaken by the public sector.

   The National Academy of Sciences calls for a new vision in agricultural research. To this end, they make a number of recommendations. Some of these are that Congress should increase funding for agricultural research; that competitive grants, i.e. peer-reviewed science, should be broadly embraced in agricultural research; that there should be balanced stakeholder input; that more links should exist between the NSF, NIH, Department of Energy and USDA; and that new leadership is needed.

   In essence, the NRC argues that a new agricultural research model is needed.

Article

"The Agricultural Grants Program" (1981)
In this article from *Science*, the publication of the American Association for the Advancement of Science (AAAS), David Krogmann and Joe Key discuss the increasing need for peer-reviewed science to take hold in agricultural research. They point out that peer-reviewed science has not been fully embraced at the USDA for political, institutional and administrative reasons, but that because there have been a few USDA pilot programs that included peer-reviewed science, we have a wonderful natural experiment between formula funds and special grants in comparison with competitive peer-reviewed science. What we learn from that experiment is that "basic research seems to prosper by minimizing administrative direction and maximizing the opportunity of the investigator to exploit new opportunities" (p. 182); thus, if research is to flourish, it needs to be done in a competitive environment.

Conclusion
Much can be learned from the above article and reports. The themes that resonate most clearly are 1) that the U.S. is seriously under-funding agricultural research; 2) that competitive, merit-reviewed grants are important to advancing agriculture research; and 3) that a new model for agricultural research is needed.

Clearly, money is essential, but it is not enough. To successfully address the challenges and problems identified in the above reports, it is necessary – in addition to funding – to create a new institutional model that embraces competitive, peer-reviewed science as one of its fundamental planks.

APPENDIX 5: Consultants to the Task Force

The USDA Research, Education and Economics Task Force was appointed by Secretary Ann Veneman on January 21, 2003, at the request of Congress. A list of members and their affiliations appears below. The Task Force met four times: July 31, 2003; October 27, 2003; January 28, 2004, and April 20, 2004. The members studied past reports and information from the USDA, NSF, NIH and other sources. Members of the Task Force, singly or in groups, consulted with 68 knowledgeable people. We are grateful to Joe Jen, Under Secretary for Research, Education and Economics, and Katie Boots, Special Assistant to the Under Secretary, for their guidance and help.

Bruce Alberts, President, National Academy of Sciences
Martin Apple, President, Council of Scientific Society Presidents
Terry Barr, Chief Economist and Vice President, National Council of Farmer Cooperatives
Roger Beachy, President, Donald Danforth Plant Science Center
John Becherer, Chief Executive Officer, United Soybean Board
Robert Bertram, International Research and Biotechnology Specialist, U.S. Agency for International Development
Dennis Bier, Director, Children's Nutrition Research Center at Baylor College of Medicine
Kerry Bolognese, Director, Federal Relations, National Association of State Universities and Land-Grant Colleges
Kathryn Boots, Special Assistant to the Under Secretary for Research Education and Economics, U.S. Department of Agriculture
R. Ronald Bosecker, Administrator, Research Education and Economics, U.S. Department of Agriculture
Rodney Brown, Deputy Under Secretary for Research Education and Economics, U.S. Department of Agriculture
Steve Censky, Chief Executive Officer, American Soybean Association
Mary Clutter, Assistant Director, Biological Sciences Directorate of the National Science Foundation
Thomas Cooley, Director, Office of Budget, Finance and Award Management, National Science Foundation
Janice Dahl, Executive Director, United Soybean Board
Bryan Dierlam, Director of Legislative Affairs, National Cattlemen's Beef Association
Mark Drabenstott, Vice President and Director, Center for the Study of Rural America
Mitchell Dubensky, Director, Forest Resources Environment, American Forest and Paper Association
Ken Duberstein, Chairman and Chief Executive Officer, The Duberstein Group
Anthony Fauci, Director, National Institute of Allergy and Infectious Diseases, National Institutes of Health
Kirk Ferrell, Vice President of Public Policy, National Pork Producers Council
Carol Tucker Foreman, Director, Consumer Federation of America's Food Policy Institute
Howard Garrison, Director, Public Affairs, Federation of American Societies for Experimental Biology
Richard Glass, Vice President, Research and Development, National Corn Growers Association
Barbara Glenn, Director, Animal Biotechnology, Biotechnology Industry Organization
Carrie Golash, Senior Science Policy Analyst, Federation for American Societies for Experimental Biology
Michael Goldblatt, Former Director, Defense Advanced Research Projects Agency
Randy Green, United Egg Producers
Teresa Gruber, Executive Vice President, Council for Agriculture, Science and Technology
Colien Hefferan, Administrator, Cooperative State Research, Education and Extension Service
Lawrence Heider, Executive Director, Association of American Veterinary Medical Colleges
David Hess, Director, Office of Natural Resource Management, U.S. Agency for International Development
Charles Hess, Former Dean of the College of Agriculture and Environmental Sciences, University of California-Davis
Randall Huffman, Vice President of Scientific Affairs, American Meat Institute Foundation
Joseph Jen, Under Secretary for Research, Education and Economics, U.S. Department of Agriculture
Chandler Keys, Vice President of Government Affairs, National Cattlemen's Beef Association

Rick Kirckoff, Executive Vice President and CEO, National Association of State Departments of Agriculture
Ganesh Kishore, Vice President, Agriculture and Nutrition, DuPont/Solae
Samuel Klein, Director, Washington University Center for Human Nutrition
John Marburger, Director, Office of Science and Technology Policy
Dale Maronek, President, Council for Agriculture, Science and Technology
Ian Maw, Director, Academic Program for Agriculture and Natural Resources, National Association of State Universities and Land-Grant Colleges
C. Peter McGrath, President, National Association of State Universities and Land-Grant Colleges
David Meeker, Interim Scientific Liaison, Federation of Animal Science Societies
Katy Moffett, Director, PAC and Grassroots, American Forest and Paper Association
Harley Moon, Board of Agriculture and Natural Resources, National Academy of Sciences
Andrew Natsios, Administrator, U.S. Agency for International Development
Mortimer Neufville, Vice President, National Association of State Universities and Land-Grant Colleges
Susan Offutt, Administrator, Economic Research Service
Mike Phillips, Executive Director, Food and Agriculture, BIO
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Catherine Woteki, Dean of the College of Agriculture, Iowa State University

ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ARS	Agricultural Research Service
CSREES	Cooperative State Research, Education, and Extension Service
DOD	Department of Defense
DOE	Department of Energy
ERS	Economic Research Service
NAS	National Academy of Sciences
NASA	National Aeronautic and Space Administration
NIFA	National Institute of Food and Agriculture
NIH	National Institutes of Health
NRC	National Research Council
NRI	National Research Initiative
NSF	National Science Foundation
REE	Research, Education and Economics
SAES	State Agriculture Experiment Stations
SARS	Severe Acute Respiratory Syndrome
USDA	United States Department of Agriculture

ENDNOTES

[i] See, for instance, Jeffrey Mervis and Dennis Normile. "Agencies Embrace Peer Review to Strengthen Research Base." *Science*. 279 (1998): 1471 – 1473., and Richard Stone. "Germany Puts Money on Peer Review." *Science*. 278 (1997): 792 – 794.

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[v] Under Secretary Eric M. Bost, Food, Nutrition, and Consumer Services, testimony before Subcommittee on Agriculture, Rural Development, March 20, 2003. Prepared statement available on-line @: http://www.fns.usda.gov/cga/Speeches/CT03203.html. See also Allison, D.B., Fontaine, K.R., Stevems, J., and Van Itallie, T.G. "Annual deaths attributable to obesity in the United States" JAMA 1999; 282:1530-1538.

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[x] For more on this, see the following article at www.animalbiotechnology.org/ani_bio.asp?news_id=818&mode=showarticle&show=false

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[xv] Shapouri, Duffield, Graboski. "USDA Estimating the Net Energy Balance of Corn Ethanol." July 1995.

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[xviii] Report of the Committee on Research Advisory to the U.S. Department of Agriculture, 1972.

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[xviii] For instance, see Jeffrey Mervis and Dennis Normile. "Agencies Embrace Peer Review to Strengthen Research Base." *Science*. 279 (1998): 1471 – 1473., and Richard Stone. "Germany Puts Money on Peer Review." *Science*. 278 (1997): 792 – 794.

[xix] See Fuglie, Keith., Ballenger, Nicole., Day, Kelly., Klotz, Cassandra., Ollinger, Michael., Reilly, John., Vasavada, Utpal., and Yee, Jet. "Agricultural Research and Development: Public and Private Investments Under Alternative Markets and Institutions" Agricultural Economics Report No. 735. May 1996.

American Society for Nutrition

Testimony to the Senate Agriculture, Nutrition and Forestry Committee

"Investing in Our Nation's Future
Through Agricultural Research"

March 7, 2007

Mr. Chairman and Members of the Committee:

The American Society for Nutrition (ASN) appreciates this opportunity to submit testimony to the Senate Agriculture, Nutrition and Forestry Committee for the record in response to the March 7, 2007 hearing, "Investing in Our Nation's Future Through Agriculture Research." With a membership of more than 3000 scientists, ASN is the premier research society dedicated to improving the health and quality of life through the science of nutrition. Our members conduct food and nutrition research at the cellular and *in vitro* levels, in animal models, in food product development, and they conduct clinical research that explores the connection between food, nutrition and the modification of risk for acute and chronic diseases. Our members direct the Human Nutrition Research Centers funded directly or through agreements by USDA, they conduct intramural research at the agency, and many are recipients of USDA grants through the National Research Initiative.

We thank the Committee for the opportunity to discuss the future of food, agricultural and nutrition research in America. Basic and applied agricultural and nutrition research is critical to American health and the U.S. economy. Awareness of the growing epidemic of obesity and the contribution of obesity-related illness to burgeoning health care costs has highlighted the need for improved information on people's dietary intake and improved strategies for dietary change. Demand for a safer and more nutritious food supply continues to increase. Preventable dietary and physical activity related diseases cost the economy over $117 billion annually, and this cost is predicted to rise to $1.7 trillion in the next ten years. Nevertheless, funding for food and nutrition research at USDA has not increased in real dollars since 1983.

Through its agricultural subsidy and price support programs, USDA touches the lives of all Americans and its policies and programs influence both the availability and affordability of food for all Americans. The USDA is thus the single most important federal agency influencing U.S. dietary patterns. Furthermore, through the nutrition and food assistance programs, which form roughly 60% of its budget, USDA has a direct influence on the dietary intake (and ultimately the health) of millions of Americans. It is important to better understand the impact of these programs on the food choices and dietary intake and nutritional status of the vulnerable populations served by these programs.

Acknowledging its profound influence on the availability and affordability of food for all Americans, the USDA has historically been identified as the lead nutrition agency. With the epidemic of obesity spreading to children, USDA programs, research priorities and policies to shape food choices and dietary patterns are under increasing scrutiny.

USDA is responsible for three major functions with respect to human nutrition: (1) the development and translation of federal dietary guidance; (2) implementation of nutrition and food assistance programs, and complementary nutrition education; and, (3) national nutrition monitoring. The human nutrition research programs of the USDA support these three major functions to ensure evidence-based policy, accurate and valid research methods and databases, and new understanding of diet and nutritional needs for optimal health. Human nutrition research at USDA is funded primarily through two programs: its intramural arm, the Agriculture Research Service (ARS), and its competitive grants

program, the National Research Initiative (NRI) administered by the Cooperative State Research, Education and Extension Service (CSREES).

The ARS maintains essential research facilities across the country that conduct both agricultural and nutrition research. Although the NRI was authorized at $500 million in FY2006, only $181 million was appropriated, and of this amount, only $20 million was allocated to the priority areas of human nutrition and obesity. Yet, these symbiotic programs provide the infrastructure and continuous generation of new knowledge that allow for rapid progress towards meeting national dietary needs. Through its programs in Human Nutrition, as well as the related emphasis areas in Food Quality, Value and Safety, and through the research conducted at six Human Nutrition Research Centers and Land Grant Universities around the country, the USDA makes the connection between what we grow and what we eat. And additionally, through strategic nutrition monitoring conducted by USDA, we can learn more about how dietary intake affects our health.

The 2007 reauthorization of the Farm Security and Rural Investment Act (Farm Bill) presents an important opportunity to consider and enhance the nutrition research done at USDA, and we strongly support the Research Title within this legislation. To strengthen and improve the current research programs within the USDA, ASN sets forth the following principles and recommendations for your consideration.

Consider nutrition in a new paradigm for research at the USDA
In order to provide a clearer organizational mechanism to support nutrition research, ASN supports the establishment of a National Institute for Food, Agriculture **and Nutrition** (NIFAN) with the inclusion of human nutrition research as a component on par with traditional food and agriculture research. According to a 2004 report submitted by a commission led by Dr. William Danforth, "the creation of a National Institute for Food and Agriculture (NIFA) that brings into the USDA a new culture and new operating methods is essential to ensure the innovation in agriculture needed to ensure our nation's successful future." [1] We support the establishment of this new institute under USDA, but seek to broaden the mission (and hence the name) to more clearly identify its mandate to address the many nutritional challenges we face as a nation. The specific addition of nutrition research to NIFA acknowledges the strategic importance of nutrition to the mission of this new institute.

With a new paradigm should come new funding for research at USDA. ASN supports the goal of funding the Institute to a level of $1 billion over the next five years to be sustained at or above that level annually thereafter. This commitment is essential if we are to remain competitive in a global agricultural economy, meet the growing need for affordable and sustainable sources of energy, and stem the growing prevalence of overweight, obesity and preventable illness in our children, as well as food insecurity among many of our citizens.

Reauthorize Nutrition Monitoring
It is critical that USDA enhances the intramural research activities conducted by ARS that are an essential element of our national nutrition monitoring (NM) system. Such activities include the "What We Eat in America" survey, and the updating and

[1] Report of the Research, Education and Economics Task Force of the U.S. Department of Agriculture. "National Institute for Food and Agriculture: A Proposal." July 2004.

maintenance of the food composition databases. Nutrition monitoring is a unique and vitally important surveillance function in which dietary intake, nutritional status and health status are evaluated in a rigorous and standardized manner, and the findings critically inform nutrition policy and all nutrition programs. ASN supports the expansion of the mission of the NM system to include the ability to conduct regional or even community assessments. The dietary assessment component of such an expansion would fall under USDA. Thus nutrition monitoring should be reauthorized and the needed budget and staffing to implement this expansion should be supported.

National nutrition monitoring and the maintenance of accurate and current food composition database activities are part of ARS' Human Nutrition Research Program, which is evaluated every five to six years. A recent review of the program by an external scientific panel provided a strong endorsement of this program, rating it "high" in terms of the quality of the research and valuable use of federal funds.

The NRI should be funded at the full authorization level of $500 million annually
In recent years, our nation's investment in agricultural research has been declining, threatening our ability to sustain the vitality of our research portfolio. Funding for the NRI has yet to reach $200 million, despite its initial authorization of $500 million. Continuation of this neglect will inevitably undermine the success of the USDA's research programs. Thus, it is imperative that the breadth and competitive nature of the NRI portfolio be maintained and expanded to ensure our nation's excellence in agricultural research and the well-being of all Americans.

One of the NRI's strategic goals is to improve the nation's nutrition and health through two objectives: (1) to focus on improving human health by better understanding an individual's nutrient requirements and nutritional value of foods; and (2) to promote research on healthier food choices and lifestyles. The potential for nutrition research conducted as a result of NRI grants is unlimited. For example, NRI grants are helping scientists learn more about the role of food and nutrients in the prevention of chronic disease, how dietary bioactive components have widespread health benefits in humans, and how nutrition education interventions can reduce the incidence of childhood obesity, especially in low-income families.

Conclusion
The time has come to commit resources to ensure food, agricultural and nutrition research keeps apace in the 21st century, and assures the U.S. remains competitive in a global economy. ASN recommends the following for the reauthorization of the Farm Bill and for agricultural research:

- **A National Institute for Food, Agriculture and Nutrition should be established at the USDA**
- **National nutrition monitoring activities at ARS should be reauthorized and enhanced, and the food composition database updated to keep apace with the growing variation of the American food supply.**
- **The NRI should be funded at the full authorization level of $500 million annually**

From the critical basic research supported at universities throughout the nation to the important work carried out by the Human Nutrition Research Centers, USDA research

programs deserve to be supported at the highest level possible. We must maintain and magnify the breadth and competitive nature of the agricultural research portfolio, to ensure the United States' economic vitality and the well-being of all Americans.

We hope these comments are useful as Congress moves forward with the reauthorization of the Farm Bill. Please do not hesitate to contact Mary Lee Watts, ASN's Director of Public Policy and Communications, by phone at (301) 634-7112 or by email at mwatts@nutrition.org should you have any questions.

Sincerely,

Stephanie Atkinson, PhD

President

Comments of the American Society of Plant Biologists

Submitted to the

Senate Committee on Agriculture, Nutrition and Forestry

For the March 7 Hearing Record

"Investing in our Nation's Future Through Agricultural Research"

The American Society of Plant Biologists is a non-profit science society representing 5,000 plant scientists conducting research primarily at universities and including researchers with the Agricultural Research Service and private industry laboratories. ASPB's membership includes the world's leading scientists who conduct fundamental research on plants. Founded in 1924, ASPB publishes two of the most frequently cited plant science journals: *The Plant Cell* and *Plant Physiology*.

We appreciate this opportunity to submit written comments to the Committee for the March 7, 2007 hearing record on agricultural research.

Support Reauthorization of the National Research Initiative Competitive Grants Program

Reauthorization of the National Research Initiative Competitive Grants Program (NRI) within the Department of Agriculture Cooperative State Research, Education and Extension Service (CSREES) is essential to continued support for leading fundamental research in agriculture. The need for increased support of the NRI is explained by the National Research Council (NRC) in its report, "National Research Initiative: A Vital Competitive Grants Program in Food, Fiber and Natural-Resources Research." The NRC found that "Without a dramatically enhanced commitment to merit-based peer-reviewed food, fiber and natural resources research, the nation places itself at risk."

We urge the Committee to reauthorize funding authority for the NRI in the Farm Bill to enhance and build upon current leading research programs.

Support Authorization of NIFA

ASPB supports the authorization of the National Institute of Food and Agriculture as proposed in S. 2782 in the 109th Congress. The NIFA legislation contains recommendations from a report of a task force appointed by the Department of Agriculture and chaired by Dr. William Danforth. NIFA would advance fundamental knowledge of benefit to agricultural producers and consumers.

Americans look to agricultural research to help meet a number of the nation's most fundamental needs -- our food, feed and fiber supply, huge increases in supply of clean-burning transportation fuels, and a more sustainable environment. Research

supported by USDA in past years has helped bring plant science and related sciences to a point where they can project advances that will better meet increased demands for food, fiber, fuel and a sustainable environment. The increased commitment of support for fundamental research contained in NIFA would make possible greater advances in these areas. NIFA would bring the needed commitment of research to help address enormous demands for food, feed, fiber, and fuels produced in a sustainable manner.

Support Authorization of the Specialty Crop Research Initiative

The Specialty Crop Research Initiative proposed by the Department of Agriculture for inclusion in the Farm Bill would invest $1 billion over ten years to provide science-based tools to the specialty crop industry. Specialty crops grown in the U.S. represent $49 billion in sales. Increasing the level of federal research support devoted to study specialty crops can be expected to lead to new varieties that will: reduce susceptibility of specialty crops to freezes and other severe weather conditions; and enhance crop growth, development and yield. Scientists can project advances in research that will lead to increased phytonutrient content of specialty crops, which would contribute to the improved health and nutrition of Americans. ASPB supports authorization of the Specialty Crop Research Initiative.

Reorganization Proposals

There are significant differences between managing an intramural research program and extramural research program. A number of the keys to the success of the research programs of CSREES and the Agricultural Research Service are the knowledge, experience and dedication of current CSREES and ARS national program leaders and of administrators of the agencies. We applaud Research, Education and Economics Under Secretary Gale Buchanan for assuring the Committee at its hearing March 7 that existing staff would continue to be needed and relied upon to administer and manage the Department's world-leading research programs.

Support Authorization of the Agricultural Bioenergy and Biobased Products Research Initiative

In this statement, we would like to comment to you further concerning research opportunities that would address the nation's bioenergy needs. ASPB fully supports the Department in proposing the Agricultural Bioenergy and Biobased Products Research Initiative to transition to home-grown and processed plant-based fuels and biobased products while reducing dependence on foreign petroleum.

We have sought further input of scientists, including scientists among those who contributed to the development of the Department of Energy "Research Roadmap Resulting from the Biomass to Biofuels Workshop" held December 7-9, 2005 contained in the DOE report: "Breaking the Biological Barriers to Cellulosic Ethanol" http://genomicsgtl.energy.gov/biofuels/b2bworkshop.shtml

These scientists have informed us of a need for increased research efforts within the Department of Agriculture that would complement DOE bioenergy research efforts and contribute to future production of biofuels

Those signing this letter are among a number of scientists who commented to ASPB that increased support by the Department of Agriculture is needed for basic research related t plant growth and development and biotic and abiotic stress tolerance. These and related areas of research are all of central importance to the long-term goal of maximizing plant productivity.

USDA-NRI plant research programs on gene expression and genetic diversity; environmental stress; plant biochemistry; plant growth and development; plant genomics; biobased products and bioenergy production research and other key areas provide valuable knowledge that plant breeders and growers will need to sustain increased bioenergy crop production.

Increased support for research supported by USDA-CSREES and USDA-ARS is also needed in the following areas.

1. **Carry out long-term sustainability studies on plants that are being considered for energy crops. What is needed are studies at many geographical locations for many years in which the productivity of stands of perennials (eg., switch grass, Miscanthus) and annuals (corn, sorghum) are harvested at various levels (eg., 0% of biomass, 100% of biomass) and subsequent biomass productivity is measured. This would be a very big experiment because there are many combinations of location, species, cropping level, inputs etc.**

2. **Expand collections of species that can be used for biofuels. There are relatively few accessions of potentially important bioenergy species such as switch grass and Miscanthus in the GRIN system.**

3. **Improve the breeding systems for perennial C4 grasses. Most of the species such as switch grass that are likely to be used as dedicated energy crops are self incompatible and, therefore, not amenable to development of true breeding lines for hybrid seed production. Basic studies on the mechanisms of self incompatibility in the grasses would be very useful for future breeding programs.**

4. **Identification of useful species. Are there additional plant species that could be useful as bioenergy crops?**

5. **Identification of herbicides that can be used during establishment of various energy crops.**

6. **Identification of pests and pathogens that are likely to be problems for potential energy crops. Survey for genetic diversity in natural resistance to such pests and pathogens. Develop pesticide management practices.**

7. **Determine optimal methods for long-term storage of harvested energy crops.**

8. **Evaluate fire management practices (i.e., how should energy crops be planted to minimize the danger of large fires). Are there risks associated with certain crops or with certain cropping practices?**

There are a number of specific research targets that would contribute to enhanced net photosynthetic production of feedstock crops.

*** *Responsiveness to elevated C02.* CO2 is increasing in the atmosphere and will continue to do so attaining levels 1.5 times current levels by the middle of this century. In principle CO2, should "fertilize" photosynthesis in C3 plants both by stimulating the rate of primary carboxylation and by suppressing photorespiration. But the stimulation is often substantially less than expected from theory. Moreover, what is already understood about photosynthesis suggests a variety of refinements that would increase the expected CO2 enhancement. Research aimed at understanding the determinants and improving the responsiveness of feedstock crops should be strongly supported.**

*** *Staying green (delayed senescence).* Net photosynthetic production is dictated by efficiency of photosynthesis, the amount of light that is intercepted per day, and number days that the crop intercepts light. Research aimed at delaying leaf senescence and the dismantling of the photosynthetic apparatus in the Fall has significant potential for improving seasonal biomass production of biofuel crops.**

*** *Refining photoprotection.* Plants, nearly on a daily basis, experience for a portion of the day more light than they are able to utilize in photosynthesis. For this reason, sophisticated photoprotective mechanisms have evolved that prevent damage to photosynthetic apparatus. However, these photoprotective mechanisms compete with photosynthetic efficiency. Although the trade-off between efficiency and photoprotection is clear, from an agricultural perspective, it is less apparent how well the dynamic range of the trade-off is suited for agricultural environments and productivity goals. In fact it seems clear that forfeiture of photosynthetic efficiency may under some circumstances exceed that required to prevent photodamage thus reducing net photosynthetic productivity more than necessary. It is likely that net photosynthetic production could be improved by more than 15% by research aimed at refining the control of photoprotection processes.**

*** *Reducing photorespiratory losses.* In C3 plants, photorespiration competes with photosynthesis and lowers net photosynthetic production by about 20%. Explaining why the suppression of photorespiration occurs continues to be an important goal of photosynthesis research. Newly emergent research tools and approaches clearly justify revisiting this high priority goal of photosynthesis research.**

*** *Improving water use efficiency.* Plants are forced to give up a great deal of water to take in a small amount of C02; the ratio of water molecules lost to CO2 taken up into the leaf can be as much as a 1000 to 1 under agricultural conditions. This makes net photosynthetic production very dependent on water and very susceptible to drought. However, water use efficiency, generally defined as the amount of biomass produced per unit of water used, varies among agricultural plants and even among cultivars of the same species (e.g. soybean). Research focused on discovering the genetic and physiological determinants of water use efficiency should be a high priority goal for biofuel feedstock research.**

*** *Photosynthetic Electron Transfer.* Further understanding is needed of the basic photochemical processes involved in photosynthetic electron transfer. The objective would be to elucidate the primary photochemical processes involved in water oxidation. A more fundamental understanding of these processes could provide useful insights into developing synthetic mimics that could produce hydrogen from water with oxygen as a by-product.**

*** *Characterization of carbon-partitioning mechanisms in plants.* The objective would be to design metabolic engineering strategies to enhance carbohydrate storage for biofuel production. For example, researchers are discussing ways to reduce non-fermentable fiber and a promising way to do this is modify carbon partitioning mechanisms.**

Metabolic Engineering

To transition to a plant-based energy economy, more investment is needed in plant research on metabolic engineering. In order to attempt to modify existing crop plants (or other plants that would then serve as new energy crops) in a way that will enhance their properties for use as either fuels or as specialty chemical feedstocks, we must understand the metabolism of those plants and we must be able to predictably and accurately modify the metabolism in those plants. There is a rapidly growing and significant body of literature that demonstrates that production of specific individual compounds in plants is not predictable with current knowledge. Further knowledge will be needed in metabolic engineering to change large subsets of metabolism as may be required for alterations in biomass production.

Competing with all Imported Petroleum Market Sectors

We recommend collaborations between the Department of Agriculture and the Department of Energy in identifying ways to derive energy from a broad variety of plants for ethanol, cellulosic ethanol, and biodiesel. Both Departments have relationships with plant scientists who could share their knowledge on ways to exploit energy sources in plant cellulose in switch grass, miscanthus, trees, wood chips, crop residues and other sources of biomass.

Along with corn and sorghum, there are future ethanol production opportunities research could offer with sweet potato, sugarcane and other crops. For sugarcane, research would be needed to increase drought and cold stress tolerance. Gains in production in biodiesel from soybean and other regionally grown oil seed crops could result from accelerated bioenergy research. In addition to production of biofuels, increased support for plant bioenergy research could lead to advances in production of high-value biochemical products, such as superior quality nylon and polyurethane that have historically been derived from petroleum.

We recognize that a substantial investment of new funds is needed for the Department of Agriculture to pursue bioenergy-related plant research recommendations presented in this letter. It is essential to continue strong support for existing research programs. New funds are needed to undertake these research initiatives and the Department would provide much of the needed funds through its proposal for the Agricultural Bioenergy and Biobased Products Research Initiative

Investment of new funds in these recommended areas would result in huge benefits for the nation and its citizens. With advances in plant bioenergy research leading to production gains in home-grown ethanol, cellulosic ethanol, biodiesel and biochemical products, American farmers won't need to concede a single segment of the nation's energy supply market to foreign oil. This transition to home-grown biofuels will boost regional and local economies; help lower and stabilize fuel prices just as food-related plant research has helped stabilize the cost of food; reduce the national trade deficit; enhance national security and dramatically reduce emissions of stored carbon dioxide.

This is an exciting time in the nation's history of energy research, development and production. Please let us know if we can provide further information on plant bioenergy research opportunities.

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American Society for Horticultural Science

Statement Before The

Senate Committee on Agriculture, Nutrition, & Forestry

March 7, 2007

The American Society for Horticultural Science (ASHS), the professional society of researchers and educators keeping our horticulture industries competitive, healthy, and safe for consumers and the environment, supports continued initiatives expanding horticulture and organic research programs in new Farm Bill legislation for 2007.

As Congress reviews programs benefiting growers, producers, and consumers, it is important to note horticulture's exponential growth and important contributions for America's agricultural industry. ASHS urges the Senate Committee on Agriculture, Nutrition, & Forestry to favorably consider expanding research funds for America's 105 land-grant universities and colleges and their first-rate research facilities that sustain and enhance our plentiful supply of fruits, vegetables, nuts, and ornamental and nursery plants. As food safety continues to become an increasing concern, continued research ranging from harvest and production to packaging and distribution is necessary in order to maintain our global leadership in quality and trade competitiveness.

Over the last half century, horticulture and specialty crop research has been a consistent success story for American agriculture. According to USDA's Economic Research Service, annual farm productivity growth rates have averaged 1.76 percent. This is a direct result of research advances in areas ranging from plant biology and animal husbandry, to improved water quality, nutritional health studies, and efficient soil and resource management practices. Focusing on horticultural research and other components supporting specialty crops, ASHS members are dedicated to finding methods to maintain our abundant sources of safe and affordable food, along with other procedures promoting land conservation and wildlife protection. ERS figures demonstrate horticulture's preeminent contributions for American agriculture. In 2005 alone, horticulture accounted for $50 billion in total US cash crop receipts. Of these total receipts, vegetable production accounted for 17%, fruits and nuts (13%), and greenhouse and other ornamental nursery crops (32%, or $16 billion), in sales, respectively. Vital research programs augmenting this productivity not only meet increased nutritional needs for global consumers, they also promote education and outreach to farmers, scientists, regional farmers markets, food processors, and other organizations promoting responsible environmental stewardship.

Ever since President Abraham Lincoln signed the Morrill Land Grant Act in 1862, land-grant research has provided positive return investments for Congress, American taxpayers, and consumers. From food safety and quality to ornamental plants and open space acreage initiatives, continued research by ASHS members and America's land-grant institutions is absolutely essential for the economic well-being of our nation and continued productivity of her citizens for the 21st Century and beyond.

For more information, please contact Michael W. Neff, ASHS Executive Director, at mwneff@ashs.org or 703-836-4606

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March 5, 2007

Senate Agriculture Committee---Research Title of the 2007 Farm Bill

Chairman Harkin and Ranking Member Chambliss:

Thank you for the opportunity to provide information and timely ideas on the Research Title of the 2007 Farm Bill. We appreciate your consultation with the key stakeholders of the science research community in your quest to assure that America's world class science research community exercises its unique talents most wisely and effectively to improve our future.

The Council of Scientific Society Presidents, in its fourth decade of service to the nation, is the nation's premier center of science leadership development, and the center for defining emerging national science issues and developing strategies to address them. Our presidents are elected scientific leaders that represent over 1.4 million scientists in over 140 research disciplines. We will here address some perspectives on specific issues in the renewal of the Research Title. Most testimony that addresses the 2007 Research Title agrees that it is crucially important. The Administration proposes many annual increases in research investments to capture new opportunities, as do many nationally prominent and widely respected organizations. However, the focus of many discussions has shifted from what research to do, into how to restructure the USDA research operation. This focus detracts from the more important questions of what needs to be done. Only when we decide what needs to be done, and why, will we have a sound basis to determine what future structures will best serve that need. We conclude that USDA R&D business as usual is becoming inadequate for emerging challenges and many new problems to solve require more resources to do so.

Our most important goal is world leadership in agricultural research. From this follows other questions: What should be the role of the Federal government in agricultural research? Does the taxpayer get a measurable return on their investment in agricultural research? Is Federally funded agricultural research focused on the issues of highest priority? How can Federally funded agricultural research be optimally balanced between incremental benefit research and fundamental foundational research that offers opportunities for giant leaps forward? What options should Congress consider to improve USDA's process for planning and prioritizing research? What steps should USDA take now to improve the creativeness, quality and leadership of its research and the delivery of benefits from research? Does that require restructuring, and if so, why? Will other options work better ? What are the most focused changes that will improve research leadership? How should USDA research involve coordination and collaboration with other Federal agencies on key problems in order to avoid achieving the unmanageable and managing the unavoidable?

What should b the role of the Federal government in agricultural research?
Expert surveys across the whole nation for each of the last five years find repeatedly that

- Over 95% of the American public clearly supports the idea that the U.S. should be the world leader in scientific research;
- More than 90% of Americans believe that investing in scientific research is important to job creation and income growth in their state; and
- 4 out of 5 Americans believe that "basic science research which advances the frontiers of knowledge is necessary and should be supported by the Federal government".

Agricultural research for the Farm Bill should be defined to encompass all the research relevant to improving and reinventing the production and management systems for agriculture, the food production system including nutrition, and the environmental, economic, and rural life factors that relate to the agriculture and food system.

I will focus on "foundational research" for this broad agriculture, food, and environment sector. ***Foundational research is fundamental research achieving new discoveries that serve as the basis for either additional fundamental research or future applications.***

In addressing these purposes, the Congress should have six inextricably linked major roles that serve as criteria to benchmark its progress and evaluate its decisions:

- First, in response to the public will, to champion the sources and systems of discovery and innovation in all science domains related to agriculture to ensure the US continues world leadership;
- Second, to strengthen and build the capacity of US agricultural innovation sources, systems and processes as the critical key to sustained national strength and economic growth in a rapidly shifting worldwide political economy and scientific landscape;
- Third, to ensure adequate growth and consistent development of support for US long range frontier foundational agricultural research;
- Fourth, to vigorously lay the foundations for a defined, dynamic, better US future in all outcomes related to agriculture;
- Fifth, to ensure that the Nation has an evolving, comprehensive, strategic agricultural research plan that addresses the most important issues of the national future;
- Sixth, and very importantly, to fund and conduct research that provides the leadership the public expects, research at and beyond the frontiers of knowledge, for agriculture that is nationally relevant, addresses major national needs, contributes to an adaptable and sustainable agricultural economy, and is both generic and foundational for furthering innovation and national goals.

The decision of private sector or Federal funding for agricultural research should be viewed across a spectrum of attributes that indicate primary sponsorship, not as an absolute black or white issue.

- When the research addresses a national problem, requires a long-term, is too high a risk, or requires too large a size of investment to be likely to achieve a business sponsor, it becomes a Federal role to invest in the research to help the Nation.
- If the research has a short-term focus, addresses a local or regional problem, is a reasonable business risk, or is of a size likely to be able to achieve a business sponsor, it is not the Federal role to support it.

Thus, it is neither an issue of the government picking winners nor providing corporate welfare, but of how best to support the national interest across countless long term competing demands.

Do s the taxpayer get a measurable return on their investment in agricultural r s arch?

Over a dozen diverse studies, covering different periods and different examples, have agreed that the return on investment calculated over an extended time [after an initial lag to introduce the discoveries] for USDA sponsored or co-sponsored crop research, for example, has been 25-50% per year and that return continues for decades.

Such high returns, compared to many other types and places for research investment, strongly suggest that ***Federal government is seriously UNDERinvesting in agricultural research.*** We are not only underinvesting, but continuing a trend of investing less and less over time. The multi-year trend of erosion in support for agricultural research shrinks the pipeline of potential future PhDs in the many fields the nation will need to ensure its leadership, punishes the NASULGC universities, and ultimately diminishes the nation.

Agricultural research has a high payoff. The nation needs more agricultural research. The nation wants more agricultural research. The nation believes more research is a Federal responsibility. But the Congress provides less agricultural research.

What options should Congress consider to improve USDA's process for planning and prioritizing research?

There are three inconvenient truths to acknowledge about obstacles to future frontier research leadership:
A major impediment to research agility and frontier leadership in the USDA is the history of excessive micromanagement of USDA R&D by Congress, which slows down all decision making and undermines any willingness of USDA senior research directors to take the kinds of needed risks, some of which will fail, that university-based research leaders take routinely.

A second impediment has been the lack of adequate peer review of internal, and much external USDA funded research. The USDA-National Research Initiative (NRI) is a model of the most productive process. Since the last Farm Bill, the ARS has instituted a successful new merit review process. The complacency produced by earmarked research has begun to evolve into sharpening and improving external research ideas enough to pass merit review. In the rapidly changing world we now face, the long term success of our agricultural research depends on building successive cohorts of researchers who teach each other how to routinely sharpen and improve their ideas through winning competitive merit reviews conducted by rigorous, skeptical, outside experts. Scientists taught the wrong message, to expect a free ride that depends on who they now know in Congress, will ultimately fail to develop into our needed scientific leaders later, as research competition becomes globalized at an accelerating rate. Therefore, in an era of constrained Federal budgets, earmarked research seriously undermines our future international leadership opportunities. Instead we need to :

- Fund research through competitive awards based on merit reviews by qualified experts, where the criteria for evaluation are the quality and prospect of the ideas and their relevance to national agricultural missions.

- Use funding systems that are maximally open to all qualified scientists from all disciplines who wish to compete to participate in research for agriculture.

The third impediment is competing, shifting research priority setting mechanisms. Foundational research success is not well served by revolving door appointees to decision making posts going almost randomly ahead at uncertain intervals. Setting foundational research priorities can be done very effectively by the experienced and accomplished science community, as it is in the NSF and the NIH and parts of the USDA. All agricultural research is focused on someone's highest priority all the time. The question is: whose priorities should prevail and ultimately how can we be more objective? When should it be a Federally funded priority and when should it be a commercially funded priority?

How can Federally funded agricultural research be optimally balanced between applied incremental benefit research, and fundamental foundational research that offers many opportunities for giant leaps forward?

Commodity and specialty crop groups and food-animal groups define priorities by the most lucrative growth markets and most rapidly attained products or improvements on products that provide a competitive edge in those markets. The success of the short-term business priority model depends on the depth and breadth of pre-product foundational research available from which to draw solutions; it cannot succeed alone on a sustained basis unless that research is available. The private sector will need a wide variety of discoveries and improved innovation systems to create higher value. If the past is any guide, many of these discoveries and innovations are the kinds which we might not even be able to imagine for several years. The private sector is driven by short term profit demands and today's problems. Foundational scientists are driven by opening previously unseen doorways to entirely new knowledge and long term perspectives. Setting rigid directions, or pushing just private sector demands, may limit the direction of research imagination and decrease the chances of frontier leadership and long term success.

The USDA has a commendable record of applied research. For example, crop yields have risen throughout the 20th Century in the USA to meet growing demands. World population growth may add 3 billion new people in the 21st Century. The techniques of hybridization and backcrossing to introduce new traits, and discovery and introduction of, or creation of, new varieties, for achieving higher yield have not changed much over many decades, and now the rate of increase is leveling off. We could be reaching a peak. However, over the years, many new discoveries have been achieved that will radically change the landscape in the 21st Century.

Determining how well balanced the USDA research portfolio is, between fundamental and immediate commercial problem research, might require us to measure the frequency and quality of fundamental discoveries that provide many opportunities for further generic fundamental and further applied research across many areas of agriculture. One highly relevant domain for agricultural progress in many areas has been the recent decades of genetics research. If we delineate the many key discoveries since Avery and McLeod discovered after WWII that DNA carries inherited traits, we find DNA's double helical structure, the DNA triplet code, transfer RNA and ribosomes, retroviruses, non protein-coding DNA, ribozymes, complete gene sequence of a bacterium, making human insulin in bacteria, genetically engineered crops and animals, human genome sequence, very rapid DNA identification of pathogens, RNAi as a gene regulator, and many others as crucially important advances. While Federally employed and Federally supported scientists were involved directly in most of these major developments, and other important discoveries, almost none of them were USDA supported advances. Unfortunately the USDA did not even capture them and build on these for many years after each discovery. This is an index that the USDA is not a leader in this important field of genetics on which its future will be clearly based. The 21st Century requires that leadership to be achieved promptly by USDA.

What steps should USDA take now to improve the creativeness, quality and leadership of its research and the delivery of benefits from research?

Congress focuses the Federal senior executive service on the goal of efficiency. Some activities in the Federal government need to have *effectiveness* instead as their highest priority. The long term leadership of the nation depends on the effectiveness, not efficiency, of its Federally supported education and Federally supported research activities.

Government officials and many Federal research managers see research priorities as territorial definitions and their roles as top-down direction setting. Foundational research leaders are most successful when ignoring and disrespecting enclosures around their thinking or territorial boundaries in their research, when they are exploring from the edges of knowledge. They seek to imagine, to discover and to innovate, to see new patterns, to define and solve highly complex problems. They work from the frontiers of what is known into terrain with no prior footprints. They can see what can be done and what areas of knowledge are most open to expansion. Nurturing this has paid off many times. Effectiveness demands continuing focus on fostering creative discovery and problem solving. Federal researchers who adapt too well to the Federal efficiency priority will achieve efficiency, not leadership.

The Congress and the USDA could both benefit by being allowed to report at least annually what they achieved

that fostered and promoted creativity and creative achievement across the research domains they oversee. How many new ideas were created and published by the money allocated to research? This will help refocus the resource allocations on creative achievement, instead of excessive overhead and infrastructures overbuilt to ensure efficiency. The Federal government does not yet have a definition of, or benchmarks for, innovation. The Federal government does not have adequate definitions or benchmarks for raising creativity. It pays for both, while you only oversee and measure efficiency. The most important form of economic capital underlying the national future is the intellectual capital of imagineering. *Your most important goal in the Research Title is to find, develop, foster, nurture, capture and apply all our potential creative imagination.*

An important process to enhance your success in achieving this goal is to ensure the most open and ongoing exchange of ideas and information with the > 1 million scientists inside and outside the Federal purview . Such intense scrutiny, infusion of new thinking, and stimulation, enhances growth of our science leadership. Congressionally documented restrictions, delays, censorship, and obstructions of these exchanges are deeply damaging to the present and future national science leadership that the public demands of our science. The underfunded National Agricultural Library (NAL) has a key role in research dissemination. The NAREEE Board, established and supported by Congress, has twice proposed and justified a 30% annual increase in the NAL budget, until it is capable of filling the national needs envisioned by its reviewers. This Farm Bill must meet this need. Rapid access to required information enhances progress; the current stringency creates a bottleneck in information flow instead.

Another need to fill is the enhancement and expansion of the rapid capture of value from fundamental research. Both by expanding translational research and by developing new and improved systems for translating the many hundreds of new discoveries each year that go far beyond new crop varieties and pest resistance or ethanol fuel, the 2007 Research Title has the chance to seize the opportunity to enhance the economic redevelopment of rural America with widespread entrepreneurial ventures built on USDA-funded research.

Should USDA research involve full time collaboration with other Federal agencies in k y agricultural areas in order to avoid the unmanageable and manage the unavoidable:

Four examples

Congress should weigh the merits of authorizing the NSTC to form new, highly concentrated, action-plan-focused, coordination committees across all Federal agencies, for the five year term of the farm Bill, that will report frequently and publicly, and specifically address developing a practical, integrated, dynamic, national scale perspective on issues of water quality and quantity, frontier genetics, climate change and agriculture, and invasive pathogens in agriculture.

Achieving solutions to these four problem sets might require $500 million per year in new Research Title investments. Failure to solve them now will likely cost us later over $1 billion/year for each one.

- **Water Issues**
  Much intensive agriculture is conducted on land that is experiencing uncertain future water supplies. Urban and other environmental demands for water are rising. Rainfall is abundant in the Northeast, but uncertain across the West and Southwest Aquifers are being depleted. We lack, but need to achieve now, comprehensive information sufficient to appreciate, the long term past and future dynamics of water quality and quantity. We measure too little and act too late. We need to research the necessary information on an hydro-eco-regional and national scale, and bring all our Federal and state agencies together to understand the situation in depth and create long term fair solutions. The Congress gives control over water to over a dozen competing subcommittees. Systems problems such as water can't be solved in uncoordinated small pieces. We know that piecemeal and patchwork non-solutions only move the problems elsewhere or temporarily appease them. Many agencies, US Forest Service, US Geological Survey, EPA, NOAA, NASA, USDA and others must advance occasional intercommunication into actual full scale collaboration to anticipate and solve our problems while they are still manageable and before they escalate to unsolvable dimensions. Nothing short of nationally integrated dynamic perspectives will bring a national solution.

- **USDA Genetics R&D Preeminence Needed**
  The USDA has a history of being a follower in advances in frontier genetics. The future problems and opportunities faced by the USDA require it to achieve world leadership, and do it now.

The growing germplasm collections of the USDA, mostly obtained from other nations, provide both opportunities for many new food sources, specialty crops, high yield and disease resistance, or many new bioproducts and bioenergy sources, and to address growing risks, such as those from invasive species, the political economy of world agriculture, and the mega-impacts of climate changes. Our opportunity to used the most advanced biotechnology to achieve needed results in the future in a more timely manner, weeks instead a decade, has become a necessity to become the most agile in the face of changing national and world markets, of responses to foreseeable risks such as drought resistance, or of unexpected or impending disasters such as new pathogens. The amount invested in this portion of the USDA R&D needs to be grown rapidly over the coming five crucial years to invest in more germplasm and gene bank infrastructure and services, to develop genetics tools banks for molecular genetics, to develop a shrinking pipeline of future expertise into a growing one, and to grow the innovation levels of the USDA genetics enterprises to the point of world leadership. US agriculture cannot afford to be other than the leader here.

- **National Climate Change**
  The scientific community worldwide has recognized, and brought to the attention of governments across the world over many years, the importance of mitigating the future damage from the climate change now underway. Alternative and CO_2-free energy and energy conservation are part of the needed action. Our state governments have stepped into the gaping void of Federal leadership for this global necessity. Inadequate national planning leaves the nation's agriculture neither able to avoid the unmanageable nor able to manage the unavoidable of the many serious consequences of already advancing climate change. There will be changes in historic patterns of rainfall, snow and ice packs, grassland growth rates, high and low daily temperatures, growing season length, what pollinators will be available and when, shifting pathogen ranges, and many other factors, that will require reconsideration of what food can be grown where and when. We will require new crops and food animals that optimize what will be available; new varieties of major specialty and commodity crops; and new types of resistance and yield traits that accommodate and utilize more CO_2. In short, we will need to begin, and succeed at, achieving a revolution in agriculture in a few years that requires a new national commitment, led by the Farm Bill Research Title– delay is unconscionable and failure is not an option.

- **Arrival of New Pathogens and Materials**
  Every disease of plants and animals, discovered yet or not, anywhere in the world is a future risk to our agriculture when, not if, it arrives here. We know that FMD, BSE and H5N1 could disrupt our food supply. Dozens of other pathogens, about which we know almost nothing, are being discovered that have not yet reached North America. They inevitably will.
  Invasive species are an ongoing problem, increasing as world trade increases. Insects that destroy our trees have invaded and destroyed entire species in a few years in spite of our best efforts. Invasive genes, from anthropogenic causes, represent unquantified but usually preventable risks. Just identifying the risks may not be sufficient to prevent one or more catastrophic occurrences. Nanomaterials, new wonder materials with immense benefits in a wide variety of applications, also kill laboratory animals in parts per billion. These materials, currently under no restrictions, will be likely to invade our food chain well before we can measure their presence. It is the myriad of new issues such as this, that require the USDA to have a wide breadth and major depth in many new fields of science that are so non-traditional that they may not yet be taught in agriculture courses at most universities. This requires opening the doors for application to use USDA R&D funds to all qualified scientists of all disciplines.

What steps should USDA take now to improve the creativeness, quality and leadership of its research and the delivery of benefits from research?

What we present here is a snapshot of the many issues that the new Farm Bill Research Title will have to address, some of which are even unknown at this time. Thus the role of the new Research Title is to grow USDA R&D capacity; grow its flexibility, grow its creativity and innovation; grow its scope of scientific discipline inclusiveness; grow its connection to and research integration with other Federal agencies that can help it mitigate risks and maximize new opportunities.

Of all these needs, growing USDA creativity and innovation is the highest priority and most difficult task.

But its long term payoff will be the highest. Business as usual will not address the future that USDA is facing. The use of ever more limited funds over the next five years must be as strategic as possible. This requires a concerted program of building the PhD pipeline, hiring creative high performers and ensuring that they are given maximum opportunity to succeed, and continually infusing new scientific frontier thinking and many new ideas into the existing operations. Building a new high performing creative USDA research culture is not a short term nor a quick fix task.

Does that require restructuring, and if so, into what and why?

Many of the places that the Congress allocates large amounts of USDA funds will not address these problems. The problems cannot be ignored nor suffer benign neglect. The full appreciation of the next decade of USDA problems that will require top quality USDA R&D to address and solve is greater than it might first appear.

Does this require restructuring of USDA R&D? It certainly will require a change in attitudes and actions, in priority setting, in effort to build expanded and new innovation systems, in types of new staff needed, and many other operating systems.

The new goal must be: acting on needed outcomes and greatly enhanced effectiveness. Several ideas have been presented to restructure the USDA research enterprise. The current structure could achieve these goals but not by business as usual. The Secretary of Agriculture's proposed internal mergings to improve efficiencies could achieve these actions, Yet the real needs for rapid increases of effectiveness aren't explicitly addressed as the reasons for the changes and I do not see efficiencies as the necessary solution to the needs we describe. Doing all the right things is more important than doing many more things more efficiently. The Secretary's proposal to refocus USDA on new bioproducts and biofuels do seek solutions to an important national goal, but together they do not encompass a complete enough scope of perspectives to address many other urgent problems and new agricultural research and research capacity building that is needed.

The original NIFA proposal, much simpler than other more complex proposals that incorporate NIFA, directly addresses with solutions several important aspects of what is needed: 1) it addresses new problem focused research activities and ways to bring them into existence as a succession of ongoing activities; 2) it requires the highest quality merit review of all science; 3) it rapidly takes its results out into practical use; 4) it builds a much needed pipeline of agricultural researchers from all disciplines and sources of talent. NIFA is an important step forward. The justification for more complexity than NIFA is perhaps unclear.

It is a wise strategy to start with what needs to be done and then determine how best to do it. It is an unfortunate disposition of both Congress and Federal agencies that they focus on solving discontent with results, or weak performance issues, by reorganizing first, or on too grand a scale, and trying to make the new organization function next. The history of the DHS should be enough said about the risks of that philosophy.

In summary, there are many neglected, major, new, and unsolved problems and opportunities and a diversity of very significant emerging needs of the nation that must be addressed and solved, many in the near future to ensure retaining American leadership, via the enhanced effectiveness of the USDA national R&D enterprise. This enhanced effectiveness requires substantially more resources than have been provided in the last five years. The problems are real, pressing and failure to solve them is not an option. The public supports such investment by overwhelming margins and the measurable return on investment is likely to be exceptionally high.

Please don't hesitate to contact us for additional information or help.

Sincerely,

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NATIONAL COALITION FOR FOOD AND AGRICULTURAL RESEARCH

March 7, 2007

Submitted to the Committee on Agriculture, Nutrition and Forestry, U.S. Senate

"Investing in Our Nation's Future Through Agricultural Research"

Mr. Chairman and Members of the Committee, my name is Joseph H. Layton, Jr., and I am a grain producer in Maryland's Eastern Shore. I represent the American Soybean Association on the Board of Directors of the National Coalition for Food and Agricultural Research (National C-FAR). In my capacity as President of National C-FAR, I am submitting these comments for the record of the Agriculture, Nutrition and Forestry Committee's hearing, "*Investing in Our Nation's Future Through Agricultural Research*," regarding reauthorization of the Farm Bill Research Title.

National C-FAR is a *customer-led* coalition that brings food, agriculture, nutrition, conservation and natural resource stakeholders together with the food and agriculture research and extension community, serving as a forum and a unified voice in support of sustaining and increasing public investment at the national level in food and agricultural research, extension and education. More information about National C-FAR is available at http://www.ncfar.org.

Farm Bill Research Title Has Many "Customers"

I am not a researcher, though I do some experimenting in my farming operations. However, I do appreciate the vital role that researchers play in our society; and I know that I can do what I do better because of what they produce. Modern agriculture is a science-based business. I need what research and extension can provide in my soybean and corn operations. I will need the information they can provide as my son, who is now farming with me, and I start a winery operation so our farm can continue to support our two families.

I also appreciate that we are not investing enough in research, extension and education to enable them to provide the answers I need. That is why I invest some of my time in National C-FAR and as a member of the U.S. Department of Agriculture's (USDA) National Agricultural Research, Extension, Education and Economics Advisory Board—to provide input as a stakeholder and to urge increased investment in food and agricultural research, extension and education.

It is important to remember that the Research Title of the Farm Bill is not an end in itself—rather it is a vital means to many national priorities. For example, as an agricultural producer and "customer" of the food and agricultural research, extension and education system, I need the scientific outcomes and tools that an adequately funded Research Title can provide to help me do my job. The same holds true for a myriad of other "customers"—such as my fellow farmers and ranchers across the nation; the agricultural input industry; food processors; professionals in the fields of nutrition, diet and health; natural resources and environment; rural communities; and ultimately consumers of food and natural fiber around the world. Furthermore, this Committee and other Members of Congress and policy makers at all levels of government are "customers" of the Research Title. It is accurate to say that the success of every other Title in the Farm Bill and those who are charged with carrying out their respective missions is dependent in significant part on scientific outcomes and tools generated by programs authorized through the Research Title, and funded.

National C-FAR Recommended Actions

National C-FAR strongly believes that federal funding for food and agricultural research, extension and education represents a top national priority and a necessary long-term national commitment. National C-FAR appreciates the longstanding support this Committee and its Members have demonstrated over the years to authorize and advocate a sound Research Title that is intended to provide the direction and resources needed for USDA, its intramural and extramural research programs, the Land Grant system and other partners to work together to carry out research, extension and education missions. National C-FAR also recognizes that the job only begins when the Agriculture Committee completes its work, as the Appropriations Committees and the annual budget process ultimately determine the amount of funding in each of the programs. However, the Agriculture Committee has the opportunity to take action to lay out a compelling vision to help realize enhanced funding for food and agricultural research, extension and education.

While difficult choices must be made during the annual budget and appropriations process in the current challenging federal budget climate, reauthorization of the Farm Bill is the right time and opportunity for this authorizing Committee and the Congress to make a strong statement about the kinds of programs and the levels of funding needed to represent an adequate federal investment in food and agricultural research, extension and education. This is a critical next step toward building the funding levels needed to meet pressing identified food and agricultural research, extension and education needs.

Toward that end, National C-FAR urges this Committee to take the following actions:

- **Reaffirm the provision and commitment adopted in the 2002 Farm Bill Research Title to double funding within 5 years.** National C-FAR strongly supports retaining and recommitting to the provision in the current Farm Bill that calls for agricultural research "funding to be doubled over the next 5 years." To put it mildly, that goal has not been realized, as we have essentially struggled to stay even in the face of major budget challenges. National C-FAR was a strong advocate for this provision and supported a Congressional Resolution in the 107th Congress which laid the groundwork for its successful incorporation into the 2002 Farm Bill. There have been some successes, such as modest increases in appropriations for the National Research Initiative (NRI). Authorizations—and ultimately appropriations—for food and agricultural research, extension and education must be greatly enhanced to provide critical outcomes and essential tools needed by the food and agriculture system to respond effectively to multiple challenges and opportunities—including bio-security; food-linked health costs; environment and conservation; farm income and rural revitalization; biofuels; climate change; the growing world demand for food and natural fiber and improved diets; and biotechnology.
- **Authorize a National Institute for Food and Agriculture in USDA to address a significant gap in fundamental research.** National C-FAR's support for a National Institute for Food and Agriculture (NIFA) in USDA was reaffirmed by the membership at our 2006 annual meeting. NIFA was recommended by a USDA Research, Extension and Education (REE) Task Force to address a significant gap in fundamental research. National C-FAR believes *funding must be in addition to critical funding for existing USDA REE programs.*
- **Enhance the successful integrated approach.** While all research, extension and education programs have demonstrated value and require increased funding support, the integrated approach of the National Research Initiative (NRI) and similar programs has been especially effective and should be strengthened.
- **Expand public participation in priority setting and funding decisions.** As a coalition representing stakeholders in both the research, extension and education community and the "customers" who need and depend upon their outcomes, National C-FAR urges expanded public participation in the Administration's research, extension and education priority setting and funding decision process.

- **Continue to build the capacity of human expertise.** There is a continuing need to build the human capacity of expertise to do quality food and agricultural research, extension and education, and to implement research outcomes in the field and laboratory. The food and agricultural sciences face a daunting task of supplying the nation with the next generation of scientists and educators. Federal funding for research is a major factor in this capacity development. If these basic human resource needs are not met, then the nation will face a shortage of trained and qualified individuals.
- **Maintain and enhance the Extension system.** Translational education (extension) is a vital link connecting the research community to those who need and use research outcomes. The extension and education system helps translate basic and applied research outcomes into practical applications and more timely implementation by the end user community, thus helping to realize positive economic, environmental, health, food security and a host of other benefits in the food and agricultural system, and ultimately for the consuming public.

Money matters! All three proposals being discussed at today's hearing are unified in their call for increased funding. National C-FAR applauds the stated objective of NASULGC's CREATE-21 to double federal funding for food and agricultural research, extension and education, through mandatory spending of $200 million annually combined with increases in discretionary spending. National C-FAR endorses the NIFA proposal to increase funding for fundamental research to $1 billion annually within 5 years of enactment, so long as it's new money and isn't drawn from existing research, extension and education programs. USDA is to be commended for proposing a $150 million annual increase in federal funding for food and agricultural research, extension and education in the next farm bill, through both mandatory and discretionary spending. Targeted increases in biofuels and specialty crops research represent a good beginning; but other under funded areas, both capacity and competitive, remain to be addressed.

Unless sufficient funding is achieved, the best concepts about how to organize and conduct research won't be able to deliver the results we need. Therefore, National C-FAR urges this Committee to be guided in its deliberations about reauthorization of the Research Title by what will best lead to increased funding.

The USDA and CREATE-21 proposals concerning the organization of USDA's research mission will help stimulate serious debate about how to optimize and maximize this critical federal investment in the future of the U.S. food and agriculture system and the public benefits such investments provide. Underlying each of the proposals is a motivation to better fund the system. National C-FAR believes any consolidation or reorganization must (1) *strengthen stakeholder participation* in priority setting and funding decisions; (2) *preserve and enhance the level of cooperation* among intramural and extramural REE functions of USDA and universities and (3) *retain institutional memory*.

Program and funding authorizations in the next Farm Bill for all aspects of USDA's research, extension and education programs are important—including the Cooperative State, Research, Extension and Education Service (CSREES), the Agricultural Research Service (ARS), the Economic Research Service (ERS) and the Forest Service research program. Increased funding for capacity programs and competitive programs is important. Both basic and applied research, and an integrated approach encompassing extension and education, yield essential outcomes that translate into tools and solutions for the U.S. food and fiber system.

Enhanced Investment in Research, Extension & Education Essential to Success

The research, extension & education title of the Farm Bill represents the nation's *signature federal investment in the future of the food and agricultural sector. Other Farm Bill titles depend heavily upon the Research Title* for tools to help achieve their stated objectives. Public investment in food and agricultural research, extension and education today and in the future must simultaneously satisfy needs for food quality and quantity, resource preservation, producer profitability and social acceptability.

Tools provided through research, extension & education are needed to help achieve safer, more nutritious, convenient and affordable foods delivered to sustain a well nourished, healthy population; more efficient and environmentally friendly food, fiber and forest production; improved water quality, land conservation, wildlife and other environmental conditions; less dependence on non-renewable sources of energy; expanded global markets and improved balance of trade ; and more jobs and sustainable rural economic development. Societal demands and expectations placed upon the food and agricultural system are ever-changing and growing. Examples of current and future needs include—strengthened **bio-security**; **food-linked health** costs; **environment and conservation; farm income** and **rural revitalization**; **biofuels** and **climate change**; the **world demand** for food and natural fiber and improved diets; and **biotechnology** and genetic resources research and public oversight.

Demonstrated Value of Public Investments in Research

Publicly financed research, extension and education are *necessary complements to private sector research*, focusing in areas where the private sector does not have an incentive to invest, when 1) the pay-off is over a long term; 2) the potential market is more speculative; 3) the effort is during the pre-technology stage; and 4) where the benefits are widely diffused. Public research, extension and education help provide oversight and measure long-term progress. Public research, extension and education also act as a means to detect and resolve problems in an early stage, thus saving American taxpayer dollars in remedial and corrective actions.

Public investment in research is a wise investment. An analysis by the International Food Policy Research Institute of 292 studies of the impacts of ag research and extension published since 1953 (Julian M. Austin, et al, A Meta-Analysis of Rates of Return to Agricultural Research, 2000) showed an average **81 Percent** annual rate of return on public investments in ag research & extension!

Food and agricultural research, extension and education to date have helped provide the United States with a food and agricultural system that consistently produces high quality, affordable food, natural fiber and other products, while at the same time:

- *Creating jobs and income.* The food and agricultural sector and related industries provide over 20 million jobs, about 17 percent of U.S. jobs, and account for nearly $1 trillion or 13 percent of GDP.
- *Helping reduce the trade deficit.* Agricultural exports average more than $50 billion annually compared to $38 billion of imports, contributing some $12 billion to reducing the $350 billion trade deficit in the nonagricultural sector.
- *Sustaining important strategic resources.* This nation's abundant food supply bolsters national security and eases world tension and turmoil. Science–based improvements in agriculture have saved over a billion people from starvation and countless millions more from the ravages of disease and malnutrition.
- *Providing many valuable aesthetic and environmental amenities to the public.* The proximity to open space enhances the value of nearby residential property. Farmland is a natural wastewater treatment system. Unpaved land allows the recharge of the ground water that urban residents need. Farms are stopovers for migratory birds. Farmers are stewards for 65 percent of non-federal lands and provide habitat for 75 percent of wildlife.

Funding Insufficient to Address Priority Needs

By any measure, federal funding for food and agricultural research, extension and education has failed to keep pace with identified priority needs. Public and private investments in U.S. agricultural research and practical application of results have paid huge dividends to the United States and the world, especially in the latter part of the 20th century. However, these dividends are the result of past

investments in agricultural research. The unparalleled success story in the food and agricultural system is a product in large part of past investments in food and agricultural research and extension. However, federal funding for food and agricultural research, extension and education has been essentially *flat for over 20 years*, while support for other federal research has increased substantially. Public funding of agricultural research in the rest of the world during the same time period has outpaced investment in the U.S.

Stagnant public investment in food and agricultural research, extension and education may well be a result of a view that the U.S. food and agricultural system is doing fine and that funds can be redirected to other needs. The U.S. food and agricultural sector has been a world leader and has provided unprecedented value to U.S. citizens, and indeed the world community. However, societal demands and expectations placed upon the food and agricultural system are ever-changing and growing.

National C-FAR believes it is imperative to lay the groundwork now to respond to the many challenges and promising opportunities ahead through federal policies and programs needed to promote the long-term health and vitality of food and agriculture for the benefit of both consumers and producers. Stronger public investment in food and agricultural research, extension and education is essential in producing research outcomes needed to help deliver beneficial and timely solutions. Multiple examples, such as those highlighted below, serve to illustrate current and future needs that arguably merit enhanced public investment in research, extension and education so that the food and agricultural system can respond to these challenges on a sustainable basis:

- Strengthened **bio-security** is a pressing national priority. There is a compelling need for improved bio-security and bio-safety tools and policies to protect against bio-terrorism and dreaded problems such as foot-and-mouth and "mad cow" diseases and other exotic plant and animal pests, and protection of range lands from invasive species.
- **Food-linked health** costs are high. Some $100 billion of annual U.S. health costs are linked to poor diets, obesity, food borne pathogens and allergens. Opportunities exist to create healthier diets through fortification and enrichment.
- Research, extension and education are key to providing to solutions to **environmental and conservation** challenges related to global warming, limited water resources, enhanced wildlife habitat, and competing demands for land and other agricultural resources. Rural water conservation and development of drought-resistant crops have evolved from a good idea to a necessity.
- It is a *highly competitive world for food* and agriculture and rural America. There was considerable debate during the last Farm Bill reauthorization about how expanded food and agricultural research, extension and education could enhance **farm income** and **rural revitalization** by improving competitiveness and value-added opportunities.
- Energy costs are escalating, dependence on petroleum imports is growing and concerns about greenhouse gases are rising. Research, extension and education can enhance agriculture's ability to provide **renewable** sources of energy and cleaner burning fuels, sequester carbon, and provide other environmental benefits to help address these challenges, and indeed generate value-added income for producers and stimulate rural economic development.
- Population and income growth are expanding the **world demand** for food and natural fiber and improved diets. World food demand is projected to double in 25 years. Most of this growth will occur in the developing nations where yields are low, land is scarce, and diets are inadequate. Without a vigorous response, demand will only be met at a great global ecological cost.
- Regardless of one's views about **biotechnology** and genetic resources, an effective publicly funded research role is needed for oversight and to ensure public benefits.

If these challenges and opportunities are to be met, then the nation must commit to a stronger investment that reflects the long-term benefits of food and agricultural research, extension and education.

NOW is the Time to Lead the Way

This Committee can establish national policy and lay the groundwork for enhancing federal investments in food and agricultural research, extension and education in this Farm Bill reauthorization. National C-FAR respectfully urges this Committee to—

- Reaffirm the provision and commitment adopted in the 2002 Farm Bill Research Title to double funding within 5 years.
- Authorize a National Institute for Food and Agriculture in USDA to address a significant gap in fundamental research.
- Increase funding for capacity programs and competitive programs
- Strengthen funding for the successful integrated approach.
- Expand public participation in priority setting and funding decisions.
- Continue to build the capacity of human expertise.
- Maintain and enhance the Extension system.

Any consolidation or reorganization must (1) *strengthen stakeholder participation* in priority setting and funding decisions; (2) *preserve and enhance the level of cooperation* among intramural and extramural REE functions of USDA and universities and (3) *retain institutional memory*.

National C-FAR appreciates the opportunity to share its views and stands ready to work with this Committee, the Congress and other stakeholder toward a strong and effective Research Title, as well as the funding needed to achieve the outcomes needed from our research, extension and education system to help our U.S. food and agriculture system meet future challenges and opportunities. National C-FAR stands ready to work with this Committee, the Congress, the Administration and other stakeholders in crafting a strong and effective Research Title, and ultimately a doubling of funding.

Respectfully Submitted,

Joseph H. Layton, Jr., President

National
Corn Growers
Association
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National Corn Growers Association
Statement Submitted for the
Senate Committee on Agriculture, Nutrition, & Forestry
Hearing on federal research agency reorganization
March 7, 2007

The National Corn Growers Association (NCGA) is an organization founded in 1957 and represents more than 33,000 dues-paying corn growers from 48 states. The Association also represents the interests of more than 300,000 farmers who contribute to corn checkoff programs in 22 states. NCGA's mission is to create and increase opportunities for corn growers in a changing world and to enhance corn's profitability and usage across this country.

As Congress reviews Title VII of the 2002 Farm Bill, commonly referred to as the Research Title, we strongly encourage the recognition of the important role agricultural research plays in the assurance of a safe, healthy and efficient food, feed, and fuel supply. Within agricultural research, investment in research on the major cropping systems here in the U.S. provides efficiencies that may be realized to a lesser extent when applied to smaller agriculture markets.

NCGA supports strengthening the Research Title of the farm bill through the creation of a new program of competitive, merit-based grants for fundamental agricultural research supported by mandatory funding within the United States Department of Agriculture (USDA). Ideally, this new program would complement existing programs by improving agricultural science outcomes that could lead to advances such as better drought-resistant plants and healthier foods. NCGA recognizes that this kind of change does require increased resources, and as such, supports increased funding for food and agricultural research.

NCGA also desires better coordination within the Interagency Working Group focused on plant genetics to avoid redundancy and refine boundaries. USDA best serves the research community in this area by warehousing data and focusing on the functionality of plant genomes.

Research is the backbone to a profitable corn industry, a thriving rural economy and the continued supply of abundant and safe food, feed and fuel. We urge Congress to give priority to change that would help realize the concept of advancing and improving agriculture research.

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National Wheat Improvement Committee
National Association of Wheat Growers
North American Millers' Association

Submitted for the Senate Committee on Agriculture & Natural Resources
March 7, 2007
Hearing on federal research agency reorganization

NWIC, NAWG and NAMA are wholly supportive of expanding resources for agricultural research and making sure that those resources are utilized efficiently. The wheat industry has a number of core research funding needs and many of them are underfunded. However, we harbor reservations about the various proposals to reorganize agencies to address the problem; in our view the agencies are functioning well, and within the wheat research community there is strong collaboration between USDA and state research programs. Many of them are co-located and operate nearly seamlessly.

The problem is not the structure of the agencies – it is the shortage of resources available for agricultural research investments. This lack of resource applies to USDA programs, state land grant research programs, and international institutions such as CIMMYT.

CREATE-21 and NIFA

We are continuing to examine the CREATE-21 proposal for a new integrated structure and funding mechanism for federal agricultural research. At this time, we have ***reservations about this proposal***. Commitment to funding long-term, multidisciplinary and applied research has been critical to the success of US agriculture. With increased emphasis on funding of national competitive grants, ***it remains unclear if CREATE-21 will adequately support and balance core research needs at national, regional, and local levels.***

CREATE-21 uses FY07 funding for ARS and CSREES to establish a 'base' for core funding. Additional funds are then arbitrarily split on a 70% competitive / 30% capacity basis. This split fails to recognize or remedy the current situation under which many of our core programs are critically under-funded. The current ratio of 90% capacity / 10% competitive funding for agricultural research would arbitrarily change to 58% capacity / 42 % competitive after 7 years, assuming full funding. The CREATE-21 proposal authorizes significantly higher overhead rates for Universities than currently allowed, which one can argue comes at the expenses of research per-se. Create-21 establishes a powerful position of 'Director of the National Institute for Food and Agriculture' and a single advisory committee. The proposed legislation fails to detail the resulting administrative structure or decision-making responsibilities. It is unclear how commodity groups, industry, and growers will have input into research priorities and access to decision-makers through this new structure.

The US has evolved agricultural research organizations that are highly productive and complementary in mission, activities, and scope. The consolidation proposed by CREATE-21 cannot be justified based on any inadequacies in productivity or management of these organizations. Rather, ***CREATE-21 proposes a philosophical shift to short-term competitive grant funding*** to maintain agricultural long-term productivity and food security of the US. It is unclear that commodity production agriculture or major crops, such as wheat, will

be equal beneficiaries of funding when competing against environmental, natural resource, or nutritional programs. This concern applies to the NIFA/Danforth proposal as well. Similarly, it is unclear that long-term germplasm development and crop breeding efforts will compete effectively for funding with more basic, short-term research favored by federal granting agencies. We also question the timing of this initiative, as a large increase in federal funding will be needed to fully fund and successfully implement the CREATE-21 programs.

Many critical issues, such as these, are unresolved in the CREATE-21 legislation. Until these are addressed, we will continue to have reservations. We recommend holding broad industry-wide and agency-wide discussions to consider alternatives, such as strengthening our existing agencies, or to resolve inadequacies in the CREATE-21 proposal. We must strive to build an organizational structure and funding mechanism than can support all components of modern US agriculture, before dismantling the one we now have in place.

Administration's Proposal to Consolidate ARS and CSREES

We oppose the Administration's proposal to consolidate the Agricultural Research Service (ARS) and Cooperative State Research, Education, and Extension Service (CSREES) into a single agency. These agencies are highly productive and are complementary in mission, activities, and scope. Responsiveness to stakeholders and evolving research needs will be sacrificed for minor savings in efficiencies that might result from management consolidation.

The proposal fails to provide new funding strategies to support core, long-term research or establish new competitive grant programs to support more fundamental, basic research. The proposal fails to show how a single federal agency will more effectively maintain and balance critical research needs and funding at national, regional, state, and local levels. This experiment was attempted once before in the late 1970s by combining the agencies into the Science and Education Administration (SEA), and was quickly undone three years later when it was judged a failure. Rather than consolidate agencies, stakeholders must work with Congress to increase funding for both agencies and promote communications between agencies to use these funds wisely and efficiently.

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