American Ag Education in Focus

Wednesday, May 19, 2010

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A Time For Action

As our global population is projected to exceed nine billion by 2050, we face unprecedented challenges to sustainably produce sufficient food, feed, fiber, and biofuel feedstocks. Over the next 40 years, the world must produce more food than has been produced over the past 10,000 years combined, while also providing feedstock for energy production.

Agriculture is an essential market sector and promoter of human health and wellness. However, if we as a nation do not rise to the challenge of increasing agricultural production sustainably on current farmland with all of the available intellectual and physical resources, the likelihood of increasing food insecurity could lead to instability in the global, geopolitical landscape.

Three Core Educational Programs to Enhance the Agricultural Workforce

Strong, long-term investments in the agricultural sciences are needed to ensure the development of the advances and innovations needed to meet these daunting challenges. However, fewer scientists are choosing to be trained in the agricultural sciences, especially in the U.S. This downturn in enrollment is due to inadequate support for undergraduate and graduate programs in the agricultural sciences in the nation's higher education system, making this science a less attractive option.

- "The Science Behind Our Food" Program: CSAW suggests the formation of a Middle- and High School level training program that will support a pipeline of students interested in pursuing B.S., M.S., and ultimately Ph.D. degrees in the agricultural sciences. Students will learn about the interdisciplinary sciences underpinning agriculture. This program will be organized in conjunction with middle school and high school science teachers. Initial funding: **$10,000,000.**

- Agroecosystem Workforce Development for the Future: The next generation of agricultural scientists, managers, and leaders will need to be capable of blending the needs of systems beyond the field with the production needs inside of it. A scholarship program is needed to attract the best students into agricultural science studies at the B.S. level, and support faculty who facilitate experiential learning programs with the private sector. Initial funding: **$15,000,000.**

- Training the Nation's Agricultural Scientists: As more students are trained in workforce level degrees for the agricultural sciences, we will build a better recruiting pool for advanced degrees. Innovative graduate student recruitment and training programs can attract high-quality graduate students with great scientific leadership potential. Initial Funding: **$10,000,000**

Coalition for a Sustainable Agricultural Workforce (CSAW)

The Coalition for a Sustainable Agricultural Workforce is a partnership of professional scientific societies and agricultural industry leaders who have come together to generate support to train future generations of agricultural scientists to work at universities, corporations and government agencies.

Members of CSAW

American Association of Cereal Chemists International
American Phytopathological Society
American Society of Agronomy
Agrotain International LLC
BASF Corporation
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Cargill, Incorporated
CID Bio-Science, Inc.
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GROWMARK, Inc.
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Monsanto Company
National Council for Agricultural Education
National FFA Organization
PotashCorp
Rural Sociological Society
Soil Science Society of America
Weed Science Society of America
Winfield Solutions, LLC; a Land O'Lakes Company

Works Cited

UN DESA, Population Division. 2009. World Population Prospects: The 2008 Revision, Press Release. Available online at: http://bit.ly/UNPopulationProjections. Accessed on January 31, 2010.

International Food & Agricultural Trade Policy Council. 2007. Sustainability in the Food & Agricultural Sector: The Role of the Private Sector and Government. Proceedings from the 40th IPC Seminar. Available online at: http://bit.ly/SustainabilitySeminar. Accessed on January 31, 2010.

The **C**oalition for a **S**ustainable **A**gricultural **W**orkforce (CSAW)
Executive Summary

The global population is projected to exceed nine billion by 2050, posing unprecedented challenges to produce sufficient food, feed, fiber, and biofuel. Over the next 40 years, we must produce more food than has been produced over the past 10,000 years combined. Failure to meet these goals will cause food insecurity in many parts of the world, leading to instability in the global, geopolitical landscape.

To create a more sustainable future, we must prepare scientists to bring new and revolutionary approaches to agroecosystem management. However, we face mounting obstacles in attracting the best and brightest students into scientific fields of study, to assure a plentiful and safe supply of food, fuel and fiber. Economic incentives and misconceptions steer students in the basic sciences away from careers in the agricultural sciences. At the same time, budget constraints have resulted in the steady disappearance of faculty positions in agriculture at land-grant universities. If current trends continue, our workforce will lack the highly trained agronomists, soil scientists, plant breeders, pathologists, entomologists and weed scientists necessary to make the technical advances essential to meet future production and sustainability challenges, let alone control new, emerging invasive weed and insect species and pathogens that will continue to threaten agricultural systems.

Novel and innovative partnerships are needed to meet these unprecedented demands. Our nation's professional scientific societies and agricultural industry leaders have formed "The Coalition for a Sustainable Agricultural Workforce" (CSAW) to generate support to train future generations of agricultural scientists to work at universities, corporations and government agencies. Combining scientific societies' diverse perspective of science and their unbiased expertise with industry's need to employ a sophisticated workforce to provide innovative products will allow us to address these challenges we face.

With federal support, we propose to develop new partnerships to attract students and train them in the agricultural sciences. The novel approaches required to meet our sustainability challenges can only be met with new models of interdisciplinary research and education as articulated in the *A New Biology for the 21st Century* and the *Facilitating Interdisciplinary Research* reports of the National Academies. We propose to organize and deploy three educational programs immediately:

- A pipeline of students interested in pursuing B.S. degrees through to the Ph.D. must originate at the middle and high school levels. We propose developing a program entitled "The Science Behind Our Food" to educate middle and high school students about the interdisciplinary sciences underpinning agriculture. This program, organized in conjunction with 4-H and other relevant organizations, will require $10,000,000 in initial funding.

- Students with high intellectual capacity and interest in the fundamental sciences need to be made aware of the opportunities to work with food and environmental issues. Once recruited, these students will engage in experiential learning to develop a working knowledge of agroecosystems. Educational programs must prepare students to be the managers and strategic leaders in the development and implementation of sustainable agroecosystems to meet the grand challenges facing society; and in doing so, enhance global security and the quality of life for all citizens. Funding of $15,000,000 is needed to support scholarships to attract the best students into agricultural science studies at the B.S. level, and to support faculty to establish strong experiential learning programs with the private sector.

- Increasing the number of B.S. degrees who are "the best and the brightest" will provide a recruiting pool for advanced degrees. Innovative graduate student recruitment and training programs must be funded to attract high-quality students with leadership potential. We recommend funding of $10,000,000 for graduate student support in agricultural sciences.

The Coalition for a Sustainable Agricultural Workforce

Overview

As our global population is projected to exceed nine billion by 2050[i], we face unprecedented challenges to produce sufficient food, feed, fiber, and biofuel feedstock. Agriculture is essential for human health and wellness. The global agricultural enterprise currently utilizes approximately 40% of available land, accounts for 70% of fresh water consumption, produces 13.5% of the greenhouse gas emissions, and is responsible for nutrient loading to waterways. Over the next 40 years, we must produce more food than has been produced over the past 10,000 years combined[ii], as well as sufficient biofuel feedstock to ensure a secure and independent energy supply on a contracting land area with fewer inputs. Failure to meet these goals will cause food insecurity in many parts of the world, leading to instability in the global, geopolitical landscape.

The Problem

There are several limitations for implementing a sustained increase in farm productivity. From a technological standpoint, continuous improvements in productivity resulted from financial investment into agricultural research and development (R&D) in the U.S., which were then spread to the rest of the world. Today, investment into agricultural R&D is slowing down in the U.S. and shifted to developing countries. The Center for Strategic and International Studies has reported "a slowdown in spending growth and a diversion of funds away from farm productivity enhancement, which will contribute to a slowdown in farm productivity growth at a time when the market has, perhaps, begun to signal the beginning of the end of a half-century and more of global agricultural abundance."[iii]

Farming operations are set to face unprecedented stress for harmonizing productivity gains coupled with the reality of global warming. Considering agriculture's dependence on environmental conditions, future agricultural scientists will need to find solutions for mitigating climate change as well as reducing offsets that accelerate climatic changes. The challenge to achieve this projected level of production in a sustainable fashion is growing ever greater as far too few scientists are being trained and fewer young people are attracted to study science in the United States, especially Agricultural Sciences.

To create a more sustainable future, we must prepare scientists to bring new and revolutionary approaches to agroecosystem management.[iv] However, we face mounting obstacles in attracting the best and brightest students into scientific fields of study, to assure a plentiful and safe supply of food, fuel and fiber. The National Academies' report, *Rising Above the Gathering*

Storm, stresses that "the scientific and technological building blocks critical to our economic leadership are eroding at a time when many other nations are gathering strength."[v] This erosion is especially prominent among the scientific disciplines which generate the fundamental information underpinning the advances required from our agricultural enterprise.

Economic incentives and misconceptions steer students in the basic sciences away from careers in the agricultural sciences. At the same time, budget constraints have resulted in the steady disappearance of faculty positions in agriculture at land-grant universities. Retirements alone will necessitate replacement of over 50% of the agricultural scientific workforce in government and industry in the next decade. These numbers are of even greater concern since all disciplines report a decline in the number of highly qualified students entering their fields.

If current trends continue, our workforce will lack the highly trained agronomists, entomologists, pathologists, plant breeders, soil scientists and weed scientists necessary to make the technical advances essential to meet future production and sustainability challenges, let alone control new, emerging invasive weed and insect species and pathogens that will continue to threaten agricultural systems on a warming planet.

Domestically, urbanization has altered our rural demographics. Numbers alone capture only a fraction of the problem that faces our future workforce. Preparing the next generation of employee to excel in this environment will require significant changes in the training regimes.[vi] Educational programs will continue to require mastery of a subject matter area as well as increased emphasis on critical thinking and problem solving skills necessary to function in interdisciplinary teams.

Strategy

Novel and innovative partnerships are needed to meet these unprecedented demands. Our nation's professional scientific societies and agricultural industry leaders have formed "The Coalition for a Sustainable Agricultural Workforce" (CSAW)[vii] to generate support to train future generations of agricultural scientists to work at universities, corporations and government agencies. Combining scientific societies' diverse perspective of science and their unbiased expertise with industry's need to employ a sophisticated workforce to provide innovative products will allow us to address these challenges.

With federal support, we propose to develop new partnerships to attract students and train them in the agricultural sciences. The novel approaches required to meet our sustainability challenges can only be met with new models of interdisciplinary research and education as articulated in the *A New Biology for the 21st Century* and the *Facilitating Interdisciplinary Research*[viii] reports of the National Academies. We propose to organize and deploy three educational programs immediately:

Start younger

A pipeline of students interested in pursuing B.S. degrees through to the Ph.D. must originate at the middle and high school levels. We propose developing programs such as "The Science Behind Our Food" to educate middle and high school students about the interdisciplinary sciences underpinning agriculture. This program, organized in conjunction with 4-H and other relevant organizations will require $10,000,000 in initial funding.

Get hands on experience

Students with high intellectual capacity and interest in the fundamental sciences need to be made aware of the opportunities to work with food and environmental issues. Once recruited, these students will engage in experiential learning to develop a working knowledge of agroecosystems. Educational programs must prepare students to be the managers and strategic leaders in the development and implementation of sustainable agroecosystems to meet the grand challenges facing society; and in doing so, enhance global security and the quality of life for all citizens. Funding of $15,000,000 is needed to support scholarships to attract the best students into agricultural science studies at the B.S. level, and to support faculty to establish strong experiential learning programs with the private sector.

Attract the best and the brightest

Increasing the number of B.S. degrees who are "the best and the brightest" will provide a recruiting pool for advanced degrees. Innovative graduate student recruitment and training programs must be funded to attract high-quality students with leadership potential. We recommend funding of $10,000,000 for graduate student support in agricultural sciences.

Works Cited

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[i] UN DESA, Population Division. 2009. World Population Prospects: The 2008 Revision, Press Release. Available online at: http://www.un.org/esa/population/publications/wpp2008/pressrelease.pdf Accessed on January 31, 2010.

[ii] International Food & Agricultural Trade Policy Council. 2007. Sustainability in the Food & Agricultural Sector: The Role of the Private Sector and Government. *Proceedings from the 40th IPC Seminar*. Available online at: http://www.agritrade.org/events/documents/2007SustainabilitySeminar_002.pdf Accessed on January 31, 2010.

[iii] Center for Strategic and International Studies. 2010. U.S. Agricultural Research in a Global Food Security Setting: A Report of the CSIS Task Force on Food Security. Philip Pardey and Julian Alston. Available online at: http://csis.org/files/publication/100111_Pardey_USAgriRes_Web.pdf Accessed on January 31, 2010.

[iv] Council for Agriculture Science and Technology. 2010. Agricultural Productivity Strategies for the Future: Addressing U.S. and Gloabal Challenges. Issue Paper 45. Available online at: http://www.cast-science.org/websiteUploads/publicationPDFs/CAST%20Ag%20Policy%20IP45%20FINAL168.pdf Accessed on January 31, 2010.

[v] National Academies Committee on Science, Engineering, and Public Policy. 2005. Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future. Available online at: http://www.nap.edu/catalog.php?record_id=11463 Accessed on January 31, 2010.

[vi] National Academies Board on Agriculture and Natural Resources. 2009. Transforming Agricultural Education for a Changing World Committee on a Leadership Summit to Effect Change in Teaching and Learning; Board on Agriculture and Natural Resources. Available online at: http://books.nap.edu/catalog.php?record_id=12602 Accessed on January 31, 2010.

[vii] CSAW. The Coalition for a Sustainable Agricultural Workforce formed by the American Society of Agronomy, American Phytopathological Society, Crop Science Society of America, Entomological Society of America, Soil Science Society of America, Weed Science Society of America, Rural Sociological Society, American Association of Cereal Chemists International and several Industry Partners.

[viii] Committee on Facilitating Interdisciplinary Research, National Academy of Sciences, National Academy of Engineering, Institute of Medicine 2004. Facilitating Interdisciplinary Research. Available online at: http://www.nap.edu/catalog/11153.html Accessed on January 31, 2010.