

## Executive Summary

### Introduction

A formal review of the Department of Agronomy at Purdue was requested by the Director of Agriculture Research Programs with coordination through USDA CSREES. Six renowned scientists whose expertise reflects that in the department were invited to serve on the external review team. The team members are:

James P. Dobrowolski – CSREES Team Leader	Rangeland/Grassland
Ken Barbarick – Colorado State University	Teaching, Soils
Wayne Parrott – University of Georgia	Breeding/Genetics
Robert Shearman - University of Nebraska-Lincoln	Extension, Turfgrass
J. Thomas Sims - University of Delaware	Soils
Mary Wiedenhoef – Iowa State University	Cropping Systems

### Department Mission

The Agronomy Department at Purdue University provides progressive and relevant undergraduate, graduate and extension education programs; conducts high impact fundamental and applied research at multiple scales to ensure that our science addresses immediate problems and anticipates future challenges; actively engages partners in the public and private sectors; and contributes to the development of the national and international agenda for research and education.

### Faculty Expertise

We have been able to diversify our faculty by coordinating one of the most aggressive hiring initiatives in department history, with 17 new faculty hires in six years (2001-2007). We have a total of 38.55 FTEs with tenured and tenure-track faculty, an increase of 5.05 FTEs since our last review in 2002. Roughly 50 percent of our FTEs are allocated to research and 50 percent to education, of which 28 percent are dedicated to classroom teaching and 22 percent are dedicated to outreach. In addition, there are nine USDA-ARS scientists who hold adjunct faculty status in Agronomy. Within the tenured and tenure-track faculty, we have eight assistant professors, five associate professors, and 30 professors. Three of our faculty have been recognized as “distinguished professors” which is the highest academic rank on campus, one faculty member holds an endowed chair, and three faculty hold named professorships. Since 2002, we have increased the number of women faculty from six to nine and faculty from underrepresented minority groups from three to seven.

Approximately half the tenured/tenure track faculty reflect disciplines in the soil and earth system sciences and half reflect disciplines in the crop sciences. Research spans multiple scales from sub atomic to atmospheric. Faculty backgrounds reflect traditional agronomic related sciences as well as civil/environmental/industrial engineering, biology, biomathematics, hydrology, and atmospheric sciences. Six of our faculty have joint appointments with other departments and five of our faculty hold partial administrative appointments in other units on campus.

Since 2002, we have hired 14 faculty; 10 as assistant professors, one as an associate professor, and three as full professors. The opportunity to hire so many faculty in a short period of time has allowed the department to develop new or enhanced thrust areas. These new areas of expertise compliment existing programs to address fundamental and applied science at multiple scales. These thrust areas are:

Turf Physiology

Biogeochemistry

Watershed Hydrology

Maize Genetics/Breeding

Climatology

Fertility Extension

Landscape Scale Modeling

### **Planning for the CSREES Review**

The Department of Agronomy engages in frequent strategic planning as an ongoing process. Planning specifically for this review was initiated October 26, 2007 with a departmental visioning retreat. The goals of that retreat were to:

1. establish a collective focus for the CSREES review
2. identify and prioritize departmental initiatives, goals, and objectives
3. identify future departmental directions and needs
4. agree upon the next steps to take to prepare for the review

Faculty and staff were asked to respond to a series of questions that required reflection on past, present, and future departmental goals and initiatives. The questions were:

**a. Where are we now?**

What are our signature areas in the Agronomy Department?

What have been our department's major accomplishments in the last 5 years?

What are the most significant changes our department has experienced in the last 5 years?

What have been the greatest challenges in the Agronomy Department during the past 5 years?

What factors limit us from being the premier Agronomy Department in the nation?

**b. Where do we want to be? (What is our departmental vision over the next 10 to 20 years?)**

What are the priorities in the agricultural and the environmental sciences in the next 10 to 20 years?

What will be the greatest expectations from the agricultural and environmental sciences to contributing to these priorities?

What strengths does our department currently have to contribute to these priorities?

Describe strategies we should take to contribute to these priorities.

Identify faculty, facility, and equipment resources we need in order to be the premier Agronomy Department in the nation.

**c. How do we get there? (What does our department need to do to realize our vision?)**

### **Developing a Shared Vision**

Based on discussions from the retreat, faculty and staff recognized that considerable and appropriate expertise existed in the department and that to be competitive nationally and internationally we must be proactive in each of our mission areas. They identified six grand challenges to serve as focal points to encourage collaborative approaches to research and education. These grand challenges are:

- **Bio-feedstock Production and Development**
- **Chemical & Biological Constituents in the Environment and their Impact on Human and Ecosystem Health**
- **Climate Change - Impacts on Agriculture and Natural Resources**
- **Harnessing Plant Breeding and Genetics to Identify and Develop Economically Important Crop Traits**
- **International Agriculture Research and Engagement**
- **Landscape-scale Management for Sustainable Plant Production and Ecosystems**

Concept papers have been written for each grand challenge and strategies have been developed to advance our efforts in each area.

In our efforts to develop a shared vision within the department for future direction, the grand challenge concept was met with considerable enthusiasm by the faculty. As we planned for the departmental review, we decided to more fully develop this concept of the grand challenges and include our thoughts in the self study document. Thus, preparation for the review followed two paths: 1. the more traditional assessment of our mission areas in teaching, research, and extension through group discussions and, 2. use of mini-retreats to develop concept papers surrounding each of the grand challenges.

Two committees were formed to help coordinate the preparation for the review. The CSREES Review Steering Committee was charged with developing the vision and the associated self study documents for our programmatic areas in undergraduate, graduate, and extension education and in crop science and earth system science. Members of this committee are:

Joseph Anderson	Richard Grant	Lee Schweitzer
Craig Beyroudy	Brad Joern	Sandy Spitznagle
Laura Bowling	Phillip Owens	George Van Scoyoc
James Camberato	Zachary Reicher	Jeff Volenec
Melba Crawford	Darrell Schulze	
Gebisa Ejeta	Paul Schwab	

The CSREES Grand Challenge Committee was formed to further develop the vision around each of the six grand challenges and to craft a concept paper for each to reflect that vision. Members of this committee are:

Cale Bigelow	Linda Lee	Paul Schwab
Sylvie Brouder	Allen LeRoy	Ron Turco
Melba Crawford	Dev Niyogi	Jeff Volenec
Gebisa Ejeta	Herb Ohm	Tony Vyn
Eileen Kladvko	Darrell Schulze	Cliff Weil

Beginning January 2008, faculty groups met to discuss program areas and to develop a shared vision for future directions. These meetings continued through Fall, 2008. Draft

documents were written and a departmental retreat of faculty and staff was held in November, 2008 to fine tune draft documents.

Development of the grand challenge concept papers took place early in the fall semester, 2008. Three hours each week were allocated to discussion of a single grand challenge topic. A uniform format for the concept papers was followed and members of the Grand Challenge Committee assigned to a specific topic led the discussions and crafted the concept papers.

### **External feedback**

Our external advisory council provided considerable feedback about our programs throughout this planning process. At our April, 2007 meeting of the advisory council, members were asked to provide a 50,000 foot view on the relationship between higher education and the U.S. food system, with particular emphasis on the role of Purdue in advancing agriculture through research and education. At our April, 2008 meeting of the advisory council, members met with undergraduate and graduate students to pose questions (determined by the department) about curriculum, advising, quality of instruction, resource support, professional development, and limitations to pursuit of an education. In addition, the advisory council attended the November, 2008 departmental retreat to engage in discussions about future direction.

The feedback from our external stakeholders was very helpful in providing an unbiased reality check about our programs. Their insight is highly welcomed by the faculty and staff and their feedback provided us a different perspective about the impact and relevancy of our programs.

Based on the planning and year-long discussions among the faculty, staff, students, and stakeholders, priorities were developed for each of our programmatic areas. These are summarized in the sections that follow. A more complete discussion of the current status of our programs and associated priorities can be found in the self study document.

## **Program Overview**

### **Undergraduate Education**

The undergraduate program in Agronomy has 168 students enrolled in eight B.S. degree options and one associate degree. Our greatest growth has been in the Plant Breeding and Plant Genetics and the Applied Meteorology options. Since the last review the total number of students enrolled in Agronomy has declined by 5 percent, but our enrollments today are approximately 16 percent more than our low of three years ago. Seventy-nine percent of our students are male and 82 percent are from Indiana. Eight percent of our students are minority or international. SAT scores for incoming students have remained constant since the last review.

Based on a survey of Purdue Agronomy alumni, 98 percent of our graduates were happy with their undergraduate experience. Academic advising and curriculum both received high marks. The number of faculty advisors is 17, up from 10 faculty at the last review. The average number of graduates for each of the past seven years has been 46. Approximately five students each year obtain a minor in either Crop or Soil Science. Currently 95 percent of our graduates are employed at graduation. The median starting salary of our B.S. graduates is \$42,000. One hundred percent of our students participate in at least one internship program.

The faculty in Agronomy with teaching responsibilities (total teaching FTEs of 10.78) offer 64 courses at the 100 to 500 levels of which 47 percent are laboratory or field experience courses. The department has 4.5 FTEs in TA appointments.

The following are priorities for the undergraduate program:

- a. Maintain the sense of a shared mission to the scholarship and value of teaching in the department.
- b. Continue to provide a strong, forward-looking and innovative undergraduate education program that attracts a diverse, high-quality student body.
- c. Develop educational programs that reach beyond the campus through K-12 education, distance education courses, and other Internet-based learning resources.

### **Graduate Education Program**

Total student numbers have declined from 82 in 2001 to 64 in 2008. The decline in graduate student numbers has been offset somewhat by increases in the number of post-doctoral research associates. In 2008, male graduate students only slightly outnumbered female graduate students (35 men to 29 women). We have equal numbers of students from the US and abroad; a reflection of fewer domestic students rather than an increase in students from abroad. The number of minority students has increased from one in 2001 to an average of four from 2005 to 2008. Since 2001 stipends have increased from approximately \$14,500 to approximately \$18,500; an increase of nearly 30 percent. Based on exit interviews, student satisfaction with the graduate program remains high.

The following are priorities for the graduate program:

- a. Need for more graduate-level course work.
- b. Uneven distribution of graduate advising amongst faculty.
- c. Declining graduate student enrollment.

### **Extension Education**

The Agronomy Extension group currently totals 12.93 FTEs, including 7.68 faculty FTEs and 5.25 administrative professional FTEs working in the general areas of 1) agricultural meteorology and climatology, 2) crop and soil management systems, 3) turf management systems, and 4) water and environmental quality. Since the last review, we have added an extension specialist in soil fertility.

Our high profile programming efforts include:

**Websites** such as King Corn, **State-wide Conferences** such as CCA training, **Field-based workshops** such as the Crop Diagnostic Training and Research Center, **Classroom-based workshops** such as the Indiana-Illinois Turfgrass Short Course, **High impact publications** such as the Corn and Soybean Field Guide, **Corn and soybean variety trial** from the Purdue Crop Performance Testing Program, **K-12 education** that includes high school soil and crop judging contests, **Community involvement** such as the community collaborative rain, hail, and snow (CoCoRaHS) network, and **Policy changing programs** such as the manure management planner software.

The following are priorities for the extension program:

- a. Improve the efficiency of our Extension program delivery.
- b. Foster acquisition of resources for applied research.
- c. Identify and proactively address new areas of Extension.
- d. Develop the next generation of Extension specialists.

## Earth System Science

The Earth System Science group within the Department of Agronomy has changed significantly since the last departmental review in 2002. For the 2002 review document we titled our section *Soil and Environmental Sciences*, but referred to ourselves as the *Soils Group*. Hiring new faculty since 2002 has provided the unique opportunity to transform into a program that combines traditional soil science with other disciplines, including hydrology, weather/climatology, remote sensing, geospatial technologies, and biogeochemistry. Four of the seven individuals who were hired since the last review have joint appointments in other departments. These hires brought new expertise in modeling at coarser scales and earth observation using new sensing technologies. We have tentatively adopted *Earth System Science* as a title that better reflects the composition of the current group and the focus of our research and academic program.

The following are priorities for the Earth System Science Program

- a. Develop a new corporate identity for the Earth System Science Group.
- b. Develop a conceptual research framework for the Earth System Science Group.
- c. Enhance our undergraduate and graduate education program.
- d. Acquire additional faculty expertise over the next five years.

## Crop Science

The Crop Science group in the Department of Agronomy is a multidisciplinary and collaborative team whose research and educational interests span a multitude of scales from basic molecular biology, genomics, and proteomics to application of the plant sciences in turf and farming systems. Individuals are typically involved in more than one scale such as relating differences in genotype with phenotypic expression, the interactions of genotypes with environments, the interplay of biophysical and physiological processes with cultural practices, and the merging of basic research and applied research in crop improvement. More recently, the group has committed itself to placing an emphasis on translational genomics: linking information derived from research in model systems with application in commodity-based research for crop improvement.

The following are priorities for the Crop Science Program

- a. Advance our knowledge base in the Crop Sciences.
- b. Develop integrated programs for greater impact (systems approach).
- c. Address emerging societal concerns.
- d. Further strengthen our educational (learning and engagement) efforts.
- e. Strengthen international foci for each departmental mission area.