

APPENDIX D

2002 CSREES Review and Departmental Response

**Response to CSREES Review of the
Department of Agronomy
April 8-12, 2002**

General Comments:

We were very pleased with the review and the engagement between the faculty/staff and the Review Team. The breadth of expertise represented by the Team was appropriate to assess our program directions and provide substantive suggestions for improvement during the next five years. The review was truly a reflection of entire departmental input during the preparation of the review document and throughout the week of the Review Team visit to the department.

The Program Review developed by the Team reflects a comprehensive review of our departmental programs in the three areas of our departmental mission: learning, discovery, and engagement. Our response to the Team suggestions follows the same order as presented in the Program Review document. The faculty and staff through input from appropriate cluster groups and feedback from the entire department developed responses. Recommendations from the Review Team are listed numerically.

UNDERGRADUATE EDUCATION

Compliments:

The review team complimented the undergraduate teaching program for being highly dedicated to keeping the program strong, for offering a wide variety of options, for their positive interaction within the group and with undergraduate students, for the feeling of being integrated into the department expressed by the undergraduates, for the involvement with K-12 education programs, for providing mentoring for graduate teaching assistants, for strong participation in interdisciplinary programs and for providing an international component to the curriculum. We appreciate the compliments and strive to deserve them.

Recommendations:

The review team made several suggestions for improvement of our program.

1. Undertaking of a comprehensive curriculum review. Recent development of a curriculum committee was an essential action that can serve the department well. The Team suggests the Curriculum Committee conduct the curriculum review in two stages: First undertake a comprehensive survey of the undergraduate teaching program to assess the strengths and weaknesses in the curriculum.

Response:

- a. *Preliminary data from graduating seniors on strengths and weaknesses have been collected.*
- b. *A poll of benchmark institutions to determine how we compare in scholarships, job placement and curriculum is planned.*
- c. *A survey of recent graduates and their employers is planned to determine their view of the strengths and weaknesses of the program.*

2. Second, use the survey data to evaluate and justify the continuance, removal, or replacement of courses to build the strongest possible curricula for the future. Include curriculum design in the formulation of new job descriptions.

Response:

- a. *A curriculum committee has been established in the department and charged with periodic reviews of each of the options, recommending changes, and the initial review of proposed courses.*
- b. *Review of the genetics curriculum and course content is underway.*
- c. *Each of the undergraduate curricula will be examined for their educational objectives and the course offerings evaluated to see if they meet the needs.*
- d. *Our course offerings will also be evaluated in terms of the service offered other departmental majors.*

3. Evaluate the unbalanced distribution of students in the plans of study options within the department and eliminate those that attract very few students.

Response:

We evaluated this and concluded that all options provide a niche for a few students to identify with the Department and that the cost of maintaining the options is negligible.

4. Evaluate the department's interest and ability to contribute to life-long learning for students at off-campus locations (distance education).

Response:

- a. *A new committee, Educational Technology, has been formed to encourage and coordinate distance education activities.*
- b. *The introductory soils course is being revamped to provide computer driven multimedia instruction to replace audiotape and slide presentations in the learning resource center. This will greatly simplify the production of a distance education version of the course.*
- c. *Two proposals for outside funding to develop distance education modules have been submitted.*
- d. *Compact disks (CDs) have been released on corn growth and development, weed identification and the release of one on soybean growth and development is imminent.*

5. The Team strongly encourages faculty to offer students opportunities to learn to be life-long leaders as well as life-long learners. Experiential opportunities such as internships should be expected of all graduates.

Response:

- a. *Three student organizations are actively supported by the department and our students hold office in numerous organizations on campus as well as in the national ASA student organization.*
 - b. *We are considering several options for a capstone experience for our students that include internships, senior projects, and service learning activities. We will enhance our efforts to encourage and assist our students' participation in organizations and activities that help them develop leadership as well as entrepreneurial skills and mindsets.*
6. The team challenges all faculty to contribute at some level to the creation of an innovative undergraduate program that will maintain excellence and lead the department in to the future.

Response:

We will continually remind ourselves that undergraduate education is one of the core missions of the University. Curriculum is the purview of the faculty and as such, requires full faculty participation in its design, development, and implementation. An innovative and dynamic curriculum is what we have to offer students to enhance their educational experience and to contribute to the quality of life. As such, it is our responsibility as a department to continually update and refine our curriculum to reflect state-of-the-art science and technology and to provide students with the skills, knowledge, and resources needed to contribute and lead in tomorrow's society. We will reemphasize the education responsibilities in our hiring procedures and give them more notice and recognition. We will encourage the widest possible staff participation in undergraduate teaching and activities such as clubs, soil and crop judging and the offering of opportunities for research participation.

GRADUATE EDUCATION

Recommendations:

1. The graduate curriculum should be reflective of Departmental strengths, but also flexible enough to meet the needs of the future. This flexibility should allow for integration of crop/soil/environmental thrusts in a wide variety of areas not common today.

Response:

As previously noted, a curriculum committee has been established in the Department that is charged with evaluating the curriculum at both the undergraduate and graduate student levels. To evaluate the graduate curriculum, core competencies such as ethics, communication skills, and statistics have already been defined by the faculty as essential components of graduate education. This, along with information acquired through benchmarking and surveys of former students and their employers will be used to determine how effective our graduate curriculum meets student/employer needs. The plant genetics and breeding faculty already have developed a revised curriculum that was based on benchmarking activity as well as discussion with industry representatives. The revised curriculum was strongly supported by the review team. Hiring faculty who can integrate concepts across disciplines (for example, bridging the gap between genetics and crop management) may be necessary to fully capture this opportunity.

2. Faculty should explore offering fee-based short courses on their area(s) of expertise to professionals interested in upgrading their knowledge. Distant education may prove useful in these efforts.

Response:

This is not only a graduate education issue, but instead, is generally determined by extension education programming. It will be discussed in the extension response.

3. The Team agreed with the suggestion expressed by the graduate students for a systematic program for sharing and learning about the breadth of discovery underway in the Department.

Response:

A Departmental Seminar has been created beginning fall semester 2002 that, along with off-campus speakers of known repute, will include presentations from current faculty. In addition, we are creating a seminar program in which the graduate students regularly present their own research. One seminar initiated 3 years ago is AGRY 598G Remote Sensing Seminar, which is taught each Fall, and involves researchers from over the US via distance learning linkages.

4. Faculty should provide graduate students with more training and experience in writing grant proposals.

Response:

We agree, and the Curriculum Committee will discuss this opportunity regarding how best to incorporate it into graduate student education. Currently, grant writing is part of AGRY 605, so there is precedence for it in the education of plant breeding students.

5. Identifying graduate degrees that reflect concentration areas should be explored as a potential benefit to graduate students entering a competitive marketplace.

Response:

Both the Graduate Committee and the Curriculum Committee will review current degree offerings to insure that they are appropriate for our students.

6. Diverse areas, like environmental sciences, could benefit from additional programmatic organization to acclimate new students.

Response:

We currently have an orientation at the beginning of each semester that all new graduate students are required to attend. Nevertheless, faculty mentoring students in environmental sciences will be asked to evaluate their current programmatic organization and make adjustments as needed in order that new students efficiently adjust to graduate study.

7. The Team received mixed input on the adequacy of seminar assistance on presentation methods and delivery. The Department should insure that all graduate students are receiving adequate training in the basics of scientific communications.

Response:

Graduate seminar was revamped in Spring semester of 2002 by Drs. Johnson and Nielsen to emphasize communication skills to both peer and non-scientific audiences. This course was well received by the graduate students. However, because of the key nature of communication skills, the Curriculum Committee will examine the effectiveness of current graduate seminars in educating students in presentation techniques, and changes will be made as appropriate.

8. Some concern was voiced by the graduate students about the mixing of graduate and undergraduate students in many of their courses (500-level). The Team suggests that teachers in these courses determine the basis for these comments and provide a dual-instruction approach that demand more from the graduates than is required from the undergraduates in a dual-level course.

Response:

Adjustments are currently being made to several courses. Nevertheless, the Curriculum Committee will be asked to evaluate the mixing issue in our 500-level courses. Information will be gathered from instructors of each 500-level course in an attempt to understand the issue including: the ratio of undergraduate students to graduate students; grade distribution by group, and whether additional requirements are demanded of the graduate students. Graduate students will be surveyed in detail to better understand their specific concerns. This information will be used by the Curriculum Committee to develop solutions that will improve the curriculum for the graduate students. We anticipate additional 600-level courses being created as resources become available.

9. Evaluate the uneven distribution of graduate students among faculty. The Team was concerned that 60% of the faculty have either zero or one graduate student, and that there is a relatively small number of post-doctoral scientists in the department. This may signal a problem obtaining extramural funding in some Departmental programs.

Response:

The following information will be obtained from each faculty member in the department: graduate student numbers; funding; post-doctoral research associate numbers; laboratory space; and other resource-related issues [recognizing differences in faculty FTE distribution (Teaching, Research, Extension)]. Similar information will be obtained from "benchmark" institutions so we can compare our distribution of graduate students to that of peer institutions. These data will be used to understand the reasons for the uneven distribution of graduate students among faculty. Faculty (especially those with large research appointments) with relatively low graduate student numbers and/or few post-docs will be asked to explain the reason for their having so few students. Where deemed appropriate and possible, barriers preventing faculty from educating graduate students and post-docs will be

removed and/or incentives put in place to encourage greater involvement in graduate student and postdoctoral education.

10. The graduate programs need to be reviewed in light of the Indiana's Life Sciences Initiative and emerging opportunities for expanding research in value added agriculture and agricultural entrepreneurship.

Response:

This review is getting underway now. The Graduate Committee will review the graduate program in light of new initiatives on campus and in the state, and make recommendations to the faculty regarding changes. This issue has been recognized as important in the context of research and graduate student education. Cluster groups within the department have been formed to discuss collaborative research opportunities, funding priorities, and existing strengths. It is anticipated that if successful collaborations are established, then graduate education will benefit via increased financial support. Proposal submission for a NSF-funded graduate student-education grant is a high priority.

11. The Department faculty needs to be appropriately credited for their mentoring and support of graduate students in other departments or interdepartmental programs.

Response:

The Head of the Department of Agronomy will continue to recognize and value faculty mentoring of graduate students located in other departments on campus and in interdisciplinary programs. Excellence in graduate education could be recognized with awards (outstanding instructor, counselor) in a manner similar to that currently done at the undergraduate level. In addition, faculty will be encouraged to provide details of these activities in documents submitted for tenure and promotion decisions and their annual evaluations by the department head.

EXTENSION EDUCATION

Recommendations:

1. Identify effective delivery models to reach all farmers in the State, especially those with the largest farms. This may involve the use of Web-based technologies, key multiplier groups, or other mechanisms.

Response:

- a. Facilitate increased collaboration among campus specialists, county Extension educators, and agribusiness to better coordinate the development of educational programs offered in Indiana that satisfy the continuing education needs of certification programs. This may occur through our increased participation in entities such as Purdue Extension's Common Interest Groups and Indiana's State CCA Board.*
- b. Expand Web-based and Email delivery of decision-aid information to farmers and their consultants or advisors (our multiplier groups).*

- c. *Develop Web-based or CD/DVD-based delivery of program content to address continuing education needs of certification programs (CCA, PARP, CNMP, etc.)*
 - d. *Develop an integrated curriculum in Extension that addresses the educational needs of our audiences at the beginning and advanced levels. Input from Specialists, County Educators, and end users is needed to develop a relevant curriculum, one that meets the needs of a diverse audience and is driven by Extension. We currently have no curriculum per se, but provide a collection of educational activities that may or may not be related.*
 - e. *Develop comprehensive & intensive workshops or conferences that offer decision-aid information to farmers or address continuing education needs of certification programs (CCA, PARP, CNMP, etc.).*
 - f. *Evaluate models used in other states for collaborative on-farm research and demonstration projects that address crop production questions of farmers and work toward enhancing our roles in facilitating such activities. This will involve the need for much expanded financial support and acceptance of some research efficiency “losses” in comparison to trials conducted on outlying Purdue research centers.*
2. The Extension faculty should consider how they could best position themselves to address the needs of the anticipated specialty crop producers.

Response:

- a. *Certain resources already exist that help address the agronomic needs of specialty crop producers in Indiana. These include Purdue’s Center for New Crops & Plant Products, Purdue’s Post Harvest Grain Quality & Stored Product Protection Program, Univ. of Illinois’ Specialty Farm Products Project, Ohio State Univ.’s Small Farm New Farm Internet Resources, University of Kentucky’s New Crop Opportunities Center, the US Grains Council’s Value Enhanced Grains Solutions Project, and the Purdue University School of Agriculture Ag. Enterprise Committee.*
- b. *We plan to address the following:*
 - i. *Develop relationships or partnerships with growers, county Extension educators, seed producers, and processors to assist in identifying specialty crops with potential adaptation to Indiana climate and soils.*
 - ii. *Evaluate the potential of new specialty crops in terms of their adaptability (growth, yield, & quality) to Indiana climate and soils.*
 - iii. *Develop management practices that best maximize specialty crop yield and/or quality (variety selection, planting date, seeding rate, fertility needs, weed control, insect control, disease control, isolation requirements).*
 - iv. *Convert the archived material currently on file (particularly those of Dr. Christmas) for specialty crops (e.g., tobacco, canola, edible beans, etc.) into more available electronic formats (e.g., Web, CD).*
 - v. *Develop management practices that satisfy the agronomic requirements for identity-preserved crop production.*
 - vi. *Develop management practices that minimize the risk of transgenic “escapes” into non-transgenic crops (pollen drift, grain commingling, volunteer plants).*

3. The Team encourages the School of Agriculture and the Department of Agronomy to seek new sources of funding for applied research needed by Indiana farmers. These sources could include, but are not limited to, the following: 1) input check-offs, output check-offs, 2) endowments, 3) regional and national competitive grant programs, and 4) legislative funds.

Response:

- a. *The prevalence and magnitude of the funding sources listed above at neighboring or other benchmark universities should be assessed to compare our situation with other, similar Agronomy Extension/applied research groups. The commodity check-off funds from other states that support applied research are of particular interest.*
 - b. *Historically, legislative initiatives by commodity groups to create check-off programs have not been viewed favorably from farmer members and lobbyists for certain farmer organizations in the state (e.g., Farmers Union). However, alternatives to traditional check off programs should be considered and pursued, such as voluntary contributions from industry and commodity groups. Members of our Extension faculty and staff have always assisted the commodity groups through educational efforts with the public, but the authority to establish check-off programs rests with the State legislature.*
 - c. *We plan to pursue the development of endowment funds and other programmatic gifts. Through our engagement activities, we should also be proactive in educating potential donors and **the general public on the true cost of applied research and the extent to which Purdue University** already underwrites these activities through the regional farm system, donation of production inputs, and technical support.*
 - d. *It is imperative that we seek opportunities to be more aggressive in attracting regional and national competitive grants for applied research and Extension programming (e.g., North Central S.A.R.E).*
 - e. *The authority to lobby for increased legislative funds for applied research and Extension programming lies with the administration of Purdue University, the Purdue School of Agriculture, and the Purdue Cooperative Extension Service. However, we recognize that to aid our administration in working with the legislature, we must provide them with information about the impact of our programs and how the results from our research benefit the State's economy.*
4. Assess the educational programs of benchmark universities to minimize unnecessary redundancy, improve efficiency, and identify new opportunities for multi-state collaboration on regional issues.

Response:

- a. *Many of our colleagues share similar interests to engage in a common, regional programmatic evaluation that will be to the mutual benefit of all involved. We will determine how programs can be addressed regionally and where themes of excellence that are institution specific should be developed. For example, we could take the Extension memoranda of agreement that are already in place with several adjoining states and translate what is currently on paper into a trial model of an intentionally coordinated, multi-*

institutional Extension program for crops and soils. Through a regional Extension summit, initiated and hosted by Purdue, we could 1) assess the willingness of peer institutions to form formal Extension collaborations and 2) develop a trial integrated Extension program with interested institutions.

5. The Extension Administration is encouraged to explore creative modifications in the County Extension Educator role to allow for more specialization in a technical area without losing the direct connection to the county. One possibility would be for County Extension Educators to pool expertise among a cluster of neighboring counties.

Response:

- a. *As a member of the ANR Core Committee within Purdue Extension, our departmental Extension coordinator can champion this recommendation among his/her Extension peers and administrators.*
 - b. *Purdue Extension ANR should consider re-instituting a 3-day in-service training for new Extension Educators since so many of the new hires are unfamiliar with our specialists or the applied research being conducted throughout the School of Ag.*
6. The Extension faculty is encouraged to engage County Extension Educators more fully in program planning, development, and delivery.

Response:

- a. *As a collective, we will participate and provide leadership towards the effective functioning of the Common Interest Groups (CIGs) within Purdue Extension through more active participation and leadership roles. Purdue Extension ANR should encourage and reward the participation of interested county Extension Educators in these CIGs.*
 - b. *We will coordinate more opportunities for county Extension educator in-service training in current production and environmental topics.*
7. Provide leadership for the formation of multidisciplinary, integrative teams for program development and delivery. This should include faculty from within and outside the Department of Agronomy.

Responses:

- a. *This recommendation overlaps with the fulfillment of Recommendation #6 above.*
 - b. *Examples of such teams already exist that involve Agronomy Extension staff as members including the Crop Diagnostic Training Center, the Extension Land Use Team, the Integrated Resource Management Program (beef), the Site-Specific Management Center, the Soil & Water Quality program (formerly Clean Water Indiana), the Indiana Forage Council, the Midwest Regional Turf Foundation, the Forage CIG, and the Laboratory for Applications of Remote Sensing (LARS).*
8. Seek opportunities to establish a greater presence relative to environmental issues in rural-urban interface environments. The 12 Conservation Program Specialists already represent a significant opportunity for collaboration and magnification of Extension educational programs addressing natural resources issues.

Responses:

- a. *The Soil & Water Quality program (which includes the specialists mentioned above) coordinates soil and water conservation educational programs among agencies such as Soil & Water Conservation Districts, Purdue Extension, USDA-Natural Resources Conservation Service, IN Dept of Natural Resources Division of Soil Conservation, and other cooperating agencies and organizations. This group is vital to our soil and water conservation outreach programs and every effort should be made to include them in team discussions and program planning.*
 - b. *The Extension Land Use Team (Common Interest Group) offers educational materials and programming to help communities address the varied issues involving rural-urban land use and quality issues.*
 - c. *The Water Quality Common Interest Group promotes and coordinates water quality education and outreach programs. Members share information about current needs and opportunities in water quality education, strategize about priorities to improve water quality in Indiana, and develop water quality materials and programs to inform the public about Purdue Extension water quality programs.*
 - d. *The Environmental Sciences & Engineering Institute facilitates research and teaching in a number of environmental issues, including bioremediation, soil quality and water quality. More than 10 Extension faculty from 4 Purdue Ag departments participate in the Institute's activities.*
9. For the Department of Agronomy to maintain an active Extension program in soil nutrient management, additional faculty or professional support will be needed. The deficiency in this area has become especially critical with the recent departure [1998] of a senior faculty member.

Response:

We agree that the need for additional Extension soil fertility/plant nutrient expertise is critical, especially in terms of addressing and responding to the educational needs of corn, soybean, and wheat growers; their crop consultants/advisors, and fertilizer input suppliers. This individual would; 1) serve as a contact and provide training for the Extension field staff in soil fertility and soil testing; 2) trouble shoot field problems and assist with the plant nutrition diagnostics of agronomic crops for the Plant and Pest Diagnostic; 3) serve as a soil fertility/plant nutrient educator at the Purdue Crop Diagnostic Training and Research Center; 4) assist in team teaching at nutrient management and crop production workshops offered by Purdue Extension; 5) develop a comprehensive soil fertility/plant nutrient Web site to service the eastern Corn Belt; and 6) serve as a contributor of newsletters on soil fertility/plant nutrient issues for Purdue's Pest & Crop Management Newsletter, Purdue's AgAnswers news service, and Purdue's Chat 'n Chew Café Web site.

10. An anticipated retirement in the area of soybean and small grain Extension will create a significant deficiency in the capacity to deliver Extension programs for one of the dominant crops [soybean] in Indiana. This may be an opportunity for the Extension faculty to consider

other models for organizing faculty expertise and focus within the general area of field crops agronomy.

Response:

We agree that the approaching retirement of Ellsworth Christmas will result in a tremendous void within our Agronomy Extension group for expertise in soybean and small grains management. Ellsworth has also devoted much research effort in canola production practices. As such, the individual hired into this position could well continue working in this or other specialty crops.

The definition of the responsibilities of both of these positions could be influenced by the success of the regional collaboration initiatives suggested in Response 4a previously. Expertise in soil fertility Extension is very limited throughout the Midwest. Eventual retirements of soybean Extension specialists in Indiana, Ohio, and Iowa could potentially result in similar limitations for soybean expertise in the Midwest. Opportunities for regional collaboration or regional centers of excellence potentially revolving around these two Extension specialty areas could be considered.

11. The team supports the proposal for the construction of an Education and Demonstration Facility at the Diagnostic Training Center as funding becomes available. This facility could be utilized for diagnostic training activities, seminars and conferences, and distance education programs.

Response:

- a. *The facilities at the Agronomy Center for Research and Education (ACRE) do not currently meet the educational needs of our Extension clientele or the modern college student. Extension education programs and student course activities would be greatly enhanced with a modern educational center at the ACRE complete with fast (T1) Internet access.*
- b. *A needs analysis was conducted by an ad hoc committee to determine the breadth of use of such a facility. Results from this analysis showed that users include the DTC, K-12 outreach, extension education activities such as field days and winter short courses, numerous visitors of the ACRE, campus based courses using the ACRE for field oriented activities, and with industry partners through internet linkages. We are currently conducting a feasibility study to determine the sources of funding of such a building.*

12. The Department should consider establishing a long-term farm equipment replacement strategy at the Agronomy Center for Research and Education. Suitable equipment is critical to applied research, which is the foundation of the Extension programs in the Department.

Response:

We strongly endorse this recommendation. Replacement of farm equipment at the ACRE, and even on many of the regional PAC farms, is essential to maintain or enhance our applied research potential and our department's relevance to agriculture in Indiana and beyond.

Other Personnel Needs Identified by Agronomy Extension Group

*The CSREES Review Team did not address the other personnel needs that were stated in the Extension section of the CSREES Review document, but we also reiterate our view that the Extension group greatly needs **Administrative and Technical Support** in the areas of 1) event coordination & support (A/P) and 2) Web page design and development (A/P). Of the two support positions, the event coordinator is deemed most critical. The recent retirement of our event coordinator resulted in a major loss in this important support area for the Extension group.*

The Web design and development support position is one the Extension group deems important for proposed Web-based educational programming. The current level of Web support in the Department is not adequate to service all of the potential needs of the Extension group, let alone those of the entire Department. The use of Web-savvy students to service these needs is an alternative solution in the short term, but does not allow for sustainable long term Web development efforts. We may be able to combine event coordination responsibilities with those of a web developer.

SOIL AND ENVIRONMENTAL SCIENCES

Environmental Fate and Transport

Recommendations:

1. Identify key thrust areas centered on current and future research and education needs of the State, the region, and the nation. Establish short-term and long-term goals and develop a process to accomplish these goals.

Response:

The Soil Science Faculty are committed to identifying priority areas of research needed at the state, national, and international levels. Finding common areas of research to best utilize unique areas of expertise within and external to the department to solve problems and educate undergraduate and graduate students is one of our priorities.

2. Maintain strengths in traditional soil research involving sustainable crop productivity, while protecting our natural resources. The agricultural clientele will depend on the Department of Agronomy to develop much needed information to address any future environmental regulations.
3. Increase the role in research areas involving nontraditional soil science applications in environmental protection, a select group of faculty already has strong research programs, and this strength should be maintained.

Response:

Recommendations 2 and 3 are related and will be addressed together.

The department remains committed to our traditional clientele and soils research areas, but we will strive to remain relevant and proactive in emerging research areas and needs.

Examples of the types of programs that already address both traditional and nontraditional needs include, Dr. Joern's Manure Management Planner software, which is supported by the NRCS and EPA; the Water Quality Field Station at the ACRE, where research is conducted to identify agricultural practices that minimize the movement of agricultural chemicals into water supplies; and the Environmental Sciences and Engineering Institute (ESEI), which brings together faculty members from across the university to address problems of regional and national significance.

Developing new programs and expanding existing programs, however, will require reallocation of current resources or identification of new resources. The "Soil Nutrient Management and Soil-Crop Modeling" position and the "Biogeochemist" position are essential for maintaining our traditional strengths while increasing our role in "nontraditional" applications.

4. Use current intra-disciplinary strengths to develop a more coordinated research and educational program. This can be accomplished only if faculty with active research programs assume a leadership role and involve other faculty.

5. Provide campus-wide leadership in research areas related to fate and transport of organic chemicals, metals, and nutrients. The Department should be the campus center for scientific expertise in this area.

Response:

Both recommendations 4 and 5 suggest that the soils group take a more active leadership role in campus programs. Leadership can take many forms and members of the soils faculty are already active in many leadership roles. The director of ESEI, Ron Turco, is a faculty member in the Agronomy Department. Through his leadership, many other soils faculty members are active in ESEI and many ESEI projects have Agronomy soils faculty members as PIs. The soils group discussed the Review Team suggestion of forming an "Environmental Research and Education Center" within the Agronomy Department. The group felt that the existing ESEI already addresses many of the issues that would be addressed by such a new center, and that our time and energy would be better spent supporting ESEI.

6. Optimize resources by forming partnerships with other departments and schools, especially in joint faculty appointments, shared technical staff, and instrumentation.

Response:

Many partnerships already exist with other departments and schools. Agronomy soils faculty members have active research collaborations with faculty across many of the departments in the School of Agriculture, as well as departments such as Civil Engineering, Pharmacy, Chemistry, and Mathematics outside of Agriculture. A number of soils faculty have close or joint appointments across schools. For example, John Cushman has a very close working relationship with the Mathematics Department and is provided an office in that building and Suresh Rao has a joint appointment in Agronomy and Civil Engineering. New hires, such as for the recently advertised Watershed Hydrologist position, will likely have a joint appointment in Agronomy and a related department. Faculty in other disciplines within the Department also have joint appointments, and includes Jeanne Romero-Severson (Agronomy and Forestry), Rebecca Doerge (Agronomy and Statistics), and Wilfred Vermerris (Agronomy and Ag. and Biological Engineering). Shared instrumentation will be addressed under recommendation 10 below.

7. Establish a faculty position with expertise and in soil and crop modeling. At present, this group lacks expertise in modeling and synthesis of research conducted at various scales. This is very critical for transferring research results from one site to another by using some simple forecast models.

Response:

This recommendation is partly being addressed in the "Watershed Hydrologist" position that has recently been advertised. We intend to hire someone with expertise in modeling and who can integrate data at the molecular and landscape scales. Redirection of faculty with expertise in crop modeling is a possibility to enhance our presence in this underrepresented area of research and educational need. A position in nutrient uptake and plant nutrition recognized as a need by the review team would also include a component of crop modeling.

8. Foster strong linkages between the faculty and those working in the 'Land Use and Landscape Processes' group. This linkage is essential for spatial extrapolation of field scale research to landscape level using GIS and remote sensing. Future faculty positions should include areas of expertise in landscape modeling using GIS and remote sensing as tools, and environmental informatics. These positions are critical to integrate soil and environmental information and develop tools for use by extension specialists for delivery to the user.

Response:

These linkages are already present in ways that may not have been apparent from the review document or our presentations. A major constraint, however, is the impending retirement of two senior faculty members in the Department and loss of one USDA scientist to another location. Within the Agronomy Department, there are 5 faculty members with primary thrusts in Land Use and Landscape Processes. Chris Johannsen is the only one with primary expertise in GIS and remote sensing, while Don Frazmeier has an active research program in soil geomorphology, soil survey, and landscape hydrology within Indiana. Both of them will retire within the next year, leaving only three faculty members in this general area. They include, Gary Steinhardt, who's program focuses on soils extension programming with some research in soil compaction; Darrell Schulze, who's research program utilizes concepts of soil genesis and geomorphology, but does not focus in that area; and Brad Lee, whose extension and research programs focus on on-site residential waste disposal. Of the USDA scientists, Mark Nearing has left West Lafayette for a new position elsewhere, while the research programs of Darrell Norton, Diane Stott, and Chi-Hua Huang focus on soil erosion processes and carbon sequestration. It is clear that the retirement of Johannsen and Franzmeier and the transfer of Nearing to a new position will leave a major void. It is important, therefore, that we plan to move forward with filling the "Earth Observation and Landscape Characterization" position and the "Evolutionary Geomorphology" (Soil Geomorphology) position in a timely manner. The "Watershed Hydrologist" position is an important part of our thrust in this area as well.

9. Invest in long-term high tech research, such as environmental sensors using nanotechnology. Return on this investment may not be near term, but will pay dividends over long term. The Department should explore opportunities to partner with other departments and obtain joint faculty positions to meet this need.

Response:

Several faculty members are working in this area (Johnston, Cushman, and Schulze) and these efforts are being coordinated with other groups on and off campus. Examples include the recently funded McKnight Foundation project that includes Johnston and Schulze working with research groups in Horticulture (Ragathama), Cornell, Brazil and Africa. One component of this project is to develop molecular scale sensors and imaging devices to study organic acid root exudation processes in plants. Another project involves the design and characterization of ultra-thin hybrid films using clay particles (Johnston and Franses in Chemical Engineering, research groups in Belgium and Hungary) for use as environmental sensors. Research in this area will provide an improved understanding of how pesticides move through soil at the nanoscale and allow us to make better predictions at the field scale

in order to prevent groundwater contamination. Also working at the nanoscale, Cushman's group has been developing ways to determine the behavior of fluids in very small spaces. Much of his work involves the behavior of simple fluids in nanopores, such as those appearing in clays and cell membranes or between proteins. Several examples are discussed at the following URL.

http://www.agriculture.purdue.edu/agricultures/currentissue/features/feature_01.html

Purdue has made a strong commitment to nanotechnology and this represents an important area of opportunity for the department in the future.

10. Partner with other cooperating departments and develop proposals for major instrumentation. The university should make a commitment to provide resources to establish instrumentation or at least provide matching funds to faculty seeking extramural funds for such equipment.

Response:

There is some shared instrumentation across departments, but the group agrees that this is an area that should and will be explored with more vigor in the future. The ability to obtain shared instrumentation through competitive grants, however, is often strongly tied to the university's commitment in providing matching funds. We urge the university to make a commitment to providing a pool of matching funds to support the efforts of faculty in seeking extramural support for equipment.

Plant and Soil Interactions

Recommendations:

11. Encourage State agricultural-business supporters to develop a fertilizer check-off for Indiana to help provide long-term support of applied nutrient related research.

Response:

We will continue to encourage the development of a fertilizer check-off program, but we are restricted in our ability to actively participate in the process due to restriction on faculty lobbying. We recently received a 10 year voluntary commitment from the fertilizer industry to support applied research in potassium fertility and nutrition. These kinds of contributions are very important to provide continuous support of difficult to fund applied research. We will look for opportunities to seek additional support from users of our services and information. This issue is more completely addressed in the extension section.

12. If the Department decides to strengthen their plant and soil interactions area, the Team recommends high priority be given to adding a soil nutrient management/ modeling position and that careful consideration be given to the merits of faculty status for the position. Since existing faculty are currently involved in this area in various ways, an opportunity should be presented to realign areas of focus to best utilize collective expertise in meeting Departmental objectives.

Response:

We believe that this position is critical to ensuring a strong state-wide and regional presence in soil fertility and plant nutrition. A similar observation was included in this response document by the Extension and Crop Science staff. There are industry and agency needs unmet because of a low staff presence in this area and we will develop a position description that fills the most critical research, teaching, and extension education needs in the soil nutrient management area.

Land Use and Landscape Processes

Recommendation:

13. Digitize soil surveys for all Indiana counties as rapidly as possible.

Response:

The digitizing of Indiana soil surveys is being accomplished by the USDA NRCS. They have digitized 28 counties and 28 more counties are in the process of being digitized. All Indiana counties will be digitized by 2005. Purdue's role in the Indiana Cooperative Soil Survey is to provide additional physical and chemical data plus interpretations for selected Indiana soils.

14. Encourage continued development of leadership and programs in the environmentally safe utilization of manures, wastewaters, biosolids and waste products.

Response:

Faculty members are serving on the State Soil Conservation District Commission, the Manure Management for Confined Feeding Operations Team, a Land Use Interdisciplinary Team and many other committees that relate to manures, wastewaters, biosolids and waste products. Other faculty will be encouraged to assist with these topic areas in research, teaching, and extension activities.

15. Within the capabilities of the resources, expand the spatial technology programs to more domestic and international partners.

Response:

The spatial technologies including remote sensing, GIS and GPS have reached many audiences through our extension and research programs. This will be continued with future hiring emphasizing the spatial technologies as a departmental priority. The UN's Food & Agricultural Organization and the World Bank have shown an interest in the Earth Observation Program and are expected to provide resources as well as recruitment of quality students. Commercial satellite companies are being approached for supporting assistantships. Purdue's Information Technology Program has indicated an interest in providing resources for the purchase of a receiving station for obtaining satellite data from around the world.

16. Future developments must link the Earth Observation and Characterization Programs with soil genesis/classification programs, with watershed programs and with land use/management programs. The linkage with crops programs must be strengthened.

Response:

A preliminary application is sought from all students who want to participate in the Earth Observation Program and a combined meeting of faculty from Purdue and the University of Leuven takes place in March of each year to review these applications. Selected students will be encouraged to make formal applications to either university. Students from Purdue will be seeking faculty as major professors and that can be any of the 10 departments associated with LARS (but doesn't need to be limited to them, especially if funds are provided). Funding for assistantships is being sought for the students enrolled at Purdue and all Agronomy faculty will have an opportunity to participate along with faculty from other departments. Several crops faculty have been participating with remote sensing activities and more will be encouraged to do so through joint funded projects.

CROP SCIENCES

Turf Sciences

Recommendations:

1. Current faculty resources (associated AP staff) are woefully inadequate.

The soon-to-be-hired additional faculty member may not meet all the teaching, research, and extension demands on the program. Additional faculty and resources will be required in the near future.

Response:

The Department is well aware of the inadequate staffing in turf. Additional faculty in turf (i.e. beyond the recent hire of Dr. Cale Bigelow) were discussed during the CSREES review process, and resulted in a recommendation for a new position (see Turf-grass Science position description). A staffing plan will be presented to the faculty. The faculty are generally supportive of additional faculty expertise in turf-related areas. The Agronomy Department is currently coordinating discussions with Botany and Plant Pathology, Entomology, Horticulture, and Forestry to develop a cluster hire in the area of Sustainable Urban Development and Design, an area of research and education that we wish to capture as a potential strength.

2. The courses dedicated to turf science are under-represented in the curriculum.

Co-teaching turf and other agronomy majors in one course, (e.g. soil fertility) diminish the turf major's competitiveness when compared to those receiving training at universities where more turf-only technical courses are available. The Team encourages using the curriculum needs assessment survey/review mentioned in the undergraduate section as a precursor to initiating the planned curriculum overhaul. In particular, address

where courses with a turf-only focus can be added to the curriculum. The Team recommends that the Department actively seek avenues to integrate turf students into other Departmental activities.

Response:

Our Soil Fertility course (AGRY 365) will be modified to be more responsive to the needs of students in the Turf major. More turf-relevant content will be taught in AGRY 365 during spring of 2003, when Dr. VanScoyoc will teach the whole course during Dr. Joern's sabbatical. The two instructors will then plan further changes to the lecture and lab content for AGRY 365 in spring of 2004.

The entire turf science curriculum is currently under preliminary review which will include a needs assessment. Plans are also being made to increase the requirements for business and communication classes for this specialization.

3. The Team suggests using the curriculum survey to establish whether graduates could benefit from additional emphasis on communications, business and management courses in the option. Additional education in these areas will give students the necessary background to work effectively in the turf industry and to move quickly into management positions.

Response: See response to #2

4. The Team suggests adding a mandatory internship at a golf course (or other turf-related facility) to the curriculum. Consideration should be given as well to broadening the experiential benefits by adding a second internship at another type of facility or in a different climatic zone than the first.

Response:

Though internships are not currently mandatory in turfgrass science, they are required for securing quality career positions upon graduation. This will be addressed in the curriculum review. A requirement for two internships in diverse climates will definitely be considered.

Plant Breeding and Genetics

Recommendations:

1. The plant breeding and genetics faculty need to determine the appropriate balance between molecular genetics and modern germplasm development, given their judgment as to the mission of the Department and the availability of resources. The presence of scientists with molecular genetics and germplasm development interests appears necessary.

Response:

The role of academics in modern germplasm development has shifted dramatically in the past five to ten years. That role is no longer primarily releasing new cultivars (a task done

more effectively by industry for large-market field crops). Rather, we view the present academic role as:

- a. exploring potentially new value-added traits that might benefit our farmers,
- b. developing alleles to support new or improving value-added traits and new markets,
- c. assessing and comparing the beneficial traits and genetic material that can be brought from wild germplasm or related plants to crop species, and then:
- d. developing effective new technologies to accelerate gene discovery and the introgression of valuable alleles into elite germplasm.
- e. this new role carries the added charge of closer coordination with the seed industry for student education, technology transfer and cultivar development for Indiana farmers.

Molecular genetics/genomics must be regarded as a powerful tool in modern germplasm development, and is always best coupled with other approaches such as cell biology, physiology and biochemistry. Development of additional tools to achieve these goals is also part of our role. We need to provide education in basic genetic and plant breeding principles and techniques. At the same time, we need to ensure the competitiveness of our students in the job market. Therefore we need to educate them in the increasing array of molecular techniques, approaches and analyses that have become predominant worldwide in plant breeding. It is essential to enhance our department's expertise in plant breeding with faculty who are able to focus on developing adapted and useful germplasm by utilizing the tools of molecular genetics and by possessing the ability to interact effectively with a range of disciplines for the crop species or trait of interest.

2. Assume greater leadership in the interdisciplinary programs such as the Purdue Genetics Program (PGP) and the Plant Biology Program (PBP) to entice other plant scientists to work on systems/commodities of interest to the Department.

Response:

These programs were started with leadership from the Agronomy Department. As the newer genetics faculty members establish their respective professional roles at Purdue, we expect that they will assume greater roles in these interdisciplinary programs. Furthermore, we anticipate that several of our current graduate faculty will be involved in the discussions this October and November on the possible formation of an Interdisciplinary Life Sciences Graduate Program that may substantially affect graduate student recruitment for all current interdisciplinary programs like the PBP and PGP. Moreover, continuing discussions among the crop faculty have already led to prospective interdisciplinary institutes that would entice cross-campus involvement on specific agricultural problems. For example, a 'Translational Genomics' institute is being planned for the application of genomic tools directly to agricultural problems.

3. The faculty should aggressively pursue a strategy for being major participants in the Life Sciences Initiative.

Response:

We expect that this initiative will be pursued over the next 5 years, and that it will be aided considerably by the hiring of a new faculty member in comparative genomics. In addition, we expect to be major players in the development of plant –based value-added or niche-product traits (see our response to # 4 below).

4. Cluster group(s) with a broad but niche-product focus should be formed to facilitate the application of molecular genetics and other disciplines to agriculture. The Team expects many niche market products will be developed using the major commodities of corn and soybeans.

Response:

The formation of cluster groups was a key part of the strategy by which the Crop Science members committed themselves to contribute - across discipline areas - to current and future niche products developed using field crops. The clusters themselves are expected to originate from the “Crops Research Group” that meets regularly to consider new initiatives and invite various specialists in for seminar presentations. Leadership encouragement by the administration is vital to reach this goal.

5. Develop new facilities for high-throughput genotyping to facilitate the application of molecular genetics to plant improvement.

Response:

The plant breeding and genetics group perceives high-throughput genotyping as one of the key technologies for accelerating gene discovery and effective selection strategies. There are many faculty members in the Agronomy department, and in the School of Agriculture, who have already spent considerable effort to develop molecular markers, and now seek to streamline high-throughput genotyping and the use of genome sequence data from related species to discover agronomically important genes. Our challenge will be to identify a robust genotyping platform that can be adapted easily to different individual’s needs; site visits to other regional genotyping centers may be important to assess the best option for consideration here. Funding for instrumentation may come from Purdue resources or an NSF multi-user instrumentation grant.

6. Re-engineering the curriculum in plant breeding and genetics to include genomics, physiology and biochemistry, and bioinformatics is highly endorsed by the Review Team.

Response:

We appreciate the endorsement, and trust that the ongoing changes to the curriculum will be beneficial to graduate students in our (and other) departments. Faculty resources in physiology are a particular constraint that we are concerned about.

Crop Physiology and Cropping Systems

Recommendations:

1. Engage more faculty in teaching. Ensure new hires include teaching responsibilities relevant to Crop Physiology and Cropping Systems priorities in whole plant physiology. Maintain an active curriculum review to identify and implement new teaching needs. Encourage shifts in assigned teaching responsibilities as teaching needs change.

Response:

- a. *We recognize the need for additional teaching resources in whole plant physiology at the graduate and undergraduate levels. Our top priority was for an additional faculty member in crop physiology. Indeed, positions in both maize and soybean physiology were proposed. All faculty are expected to teach.*
- b. *A comprehensive curriculum review is currently underway in the Department. Additional courses are being proposed, and curriculum review will be an ongoing activity within the department.*
- c. *Few shifts in assigned teaching responsibilities have been required in the past decade because of the relative stability of the more senior faculty in our group. However, instructors in the Crops area regularly updated course content to reflect new technologies and innovation in crop management and to maintain pace with changing curricular needs.*

The department's crops courses have also been dynamic in developing innovative delivery systems for our course content. As is the case with the department's soils courses, fresh new approaches (e.g. case studies, international applications of course content, multimedia and distance education modules which also are effective for resident education) are included regularly in course structure in order to maintain vitality, appeal, and effectiveness for our student population.

2. Identify faculty to lead collaborative research, teaching, and extension activities aligned within this focus area. Identify and pursue sources of funds to initiate novel collaborative activities. Expand collaborative ties with key faculty outside the Department and at other institutions to fill gaps in expertise.

Response:

We agree with this suggestion. To do this effectively will require additional faculty members, or significant shifts in responsibilities of existing faculty. Currently, only two faculty in crop physiology/cropping systems have greater than 50% research appointments (Grant, Volenec). It is unrealistic for faculty with minor research appointments (<50%) to lead this effort. It is appropriate to expect new hires in turf and crop physiology to help lead this effort and develop extensive linkages to other faculty at Purdue and beyond.

3. Structure a teaching, research and extension program for graduate education to bridge the traditional disciplines in crop management, crop improvement, and molecular genetics. This likely will require additional expertise in whole-plant and/or canopy physiology currently not available in the Department. The Department needs to fill these gaps as soon as possible. Viable possibilities include engaging faculty from other departments,

re-directing faculty research to new species or areas of emphasis, and hiring new faculty with the needed expertise.

Response:

We endorse the immediate hiring of physiologists necessary to bridge this gap, and integrate these disciplines from both a research and education perspective. The continuum of graduate courses in crop science is under review and new courses are under consideration. Existing faculty are considering the re-direction of teaching efforts as undergraduate programs change.

4. Establish a dialog with stakeholders/clients/users for input on agricultural research needs in Indiana relative to the plant improvement. Establish research outcome goals for modifying plants or plant management strategies to coalesce interdisciplinary research groups (i.e. added value, improved stress tolerance, yield increase, increase nutrient use efficiency, and land reclamation). The Team strongly recommends the Crop Physiology and Cropping Systems faculty commit to these goals and pursue them aggressively with new collaborations across departments, re-directing current research programs, and hiring new faculty to fill the obvious gaps in expertise.

Response:

A “crops research” group has been created that meets regularly. This group will also meet with stakeholders (including the departmental advisory group) in order to identify and prioritize research needs. As one example, an advisory board of predominantly industry personnel is being formed to recommend research areas in plant nutrition via the recently awarded 10-year fellowship in potassium research.

We proposed hiring several new faculty to respond to current gaps in our ability to meet research and educational needs of clients with respect to issues such as stress tolerance, yield barriers, and nutrient use efficiency. We respectfully suggest that the need is not so much for the current cropping systems and physiology faculty to “re-direct current research programs” or identify “new collaborations across departments” as it is to acquire sufficient human and financial resources to respond to the crop production needs in Indiana that are already both acute and well known.

OTHER DEPARTMENTAL ISSUES

Space Considerations: *There are several issues that face the Agronomy Department as we develop our strategies for hiring faculty and staff and enhancing our programs through leadership and collaborations. Of primary concern is the limited research, teaching, and office space. Programs of new faculty have taken on a greater laboratory presence than in the past. We have the potential to hire seven to eight faculty in the next three to four years which is a very positive situation to be in to enhance our ability to provide highly competitive educational and research programs that address the needs of our stakeholders and attract outstanding students. Space has quickly become a serious limitation to our ability to attract*

outstanding faculty and conduct meaningful research. In the long term, opportunities exist to convert some space in Plant and Soils to laboratories and offices. Financial assistance will be necessary for these transformations to occur. Additional new space needs to be sought as opportunities arise. In the short term, a new model of shared space needs to be pursued so that the needs of all our faculty are met.

Lack of adequate office space is another area of concern. As we participate in the University-wide initiative to enhance graduate student numbers, office space for students has become in short supply. New faculty bring in new graduate students. Seven to eight new faculty will likely increase current graduate numbers by 16 to 20. Our faculty in the department are also being encouraged to attract additional graduate students into their programs. If we increase our graduate numbers from these faculty by 10%, that will add eight more students to our ranks. One can clearly see that space has and will continue to be a coveted and rare commodity.

We are also in need of all our teaching classrooms to be wired and equipped for internet access. As new space is acquired or as existing space is converted, classrooms should also be included in the plans. Faculty should be engaged in the planning of these classrooms as end users. More use of teaching techniques such as case studies and discussion groups require different modes of classroom structure than traditional delivery systems such as lecture. A model classroom should be designed in Lilly that reflects the needs of multiple users and multiple uses.

Collective Commitment: *In order for these initiatives to succeed and for Agronomy to become one of the best, most highly sought after department by students and faculty in the country and a recognized state-wide and national/international leader in the discovery and dissemination of relevant information, there must be a collective commitment by faculty, staff, and administration to participate in these endeavors. We must not view ourselves as a loose collection of scientists who happen to be connected to the same department. It is important that we passionately seek to improve all programs that we offer and to recognize the responsibilities we have as a collective to improve our educational delivery systems, to take leadership in the crop and soil sciences, to stay connected to our constituents (who, by the way, are very interested and excited to be a part of the dialogue and who want us to succeed) and to contribute the well being of our faculty and staff and to the concept that as a department we can achieve these goals. Status quo cannot be accepted. There are only two choices for organizations: 1. be pro-active, anticipate a changing environment, respond to those changes and become relevant to a larger population or 2. be re-active, resistant to change and remain relevant to a narrow constituency or lose relevancy entirely. We must always look for ways to improve and enhance our relevancy to our constituents.*

