University of Kentucky
Department of Biosystems and Agricultural Engineering
Self-Study
2017

Undergraduate Program Accredited by ABET in 2016

Submitted by the Chair, D. Michael Montross, and faculty of the Department of Biosystems and Agricultural Engineering to the Dean of the College of Agriculture, Food and Environment, Dr. Nancy Cox, and to the Program Review Committee

The following academic programs are included in this report:

BAE M.S. and Ph.D.

January 8, 2018

Contents

Executive Summary

Overview of Unit

Our department has a somewhat unique administrative structure, whereby the majority of our administration is through the College of Agriculture, Food, and Environment (CAFE), however our undergraduate degree program is administered through the College of Engineering. As part of the engineering college, our department undergoes a thorough on-site accreditation review conducted by ABET, the Accreditation Board for Engineering and Technology. Our department underwent this accreditation review in 2016, and the majority of our self-study regarding the undergraduate curriculum was conducted in conjunction with that visit. Dr. Czar Crofcheck was serving as the Director of Undergraduate Studies and Dr. Joe Dvorak was the Chair of the Undergraduate Curriculum Committee. These two individuals worked closely with faculty to create the self-study for ABET. The remainder of the ABET self-study was written by the Department Chair (Dr. Sue Nokes), with the assistance of faculty and staff as needed. A copy of the self-study report utilized by the ABET review team is available at the following URL: www.uky.edu/bae/sites/www.uky.edu.bae/files/BAEUKSelfStudyReport2016Final.pdf.

The Department of Biosystems and Agricultural Engineering is one of 14 academic departments in the College of Agriculture, Food, and Environment (CAFE). The department's programs cover all three mission areas – teaching, research, and extension. The department has 18 faculty members, 6 adjunct faculty members, 30 staff members, 1 post-doctoral scholar, and 25 graduate research assistants.

The self-study document was developed by Mike Montross, Department Chair; Czar Crofcheck, Director of Undergraduate Studies; Donald Colliver, Director of Graduate Studies; Julie Tolliver, Departmental Business Officer; and Alicia Modenbach, Lecturer.

The program review committee includes Dr. Wes Harrison, Chair of Department of Community and Leadership Development UK (Committee Chair), Dr. Mary Leigh Wolfe, Department Head of Biological Systems Engineering (Virginia Tech), Dr. David Jones, Department Head of Biological Systems Engineering Department (University of Nebraska-Lincoln), Ms. Kathryn Gray, Altech, BS and MS from BAE (UK), Dr. Suzanne Smith, Professor of Mechanical Engineering (UK), Dr. Mike Sama, Assistant Professor in UK BAE, Ms. Karin Pekarchik, staff representative, UK BAE, Mr. Joe Stevens PhD candidate, UK BAE, and Mr. Brandon Sears, UK County Extension Agent.

Recommendations for Quality Enhancement – 2017

For this periodic review, the department desires to discuss and resolve several issues to increase the quality of the department.

1. Do we have the appropriate staff, faculty, and infrastructure resources? As our faculty change, the technical support required by them could be different than current staff resources. Do we need to reconsider the technical staff we have and how they are supported financially?

2. Balance the drive for grant dollars, refereed journal publications, extension publications, and student numbers to maintain a productive, well-rounded department.
3. Determine a path to modernize delivery of extension materials. Our extension faculty are not commodity specific and that limits their visibility with stakeholders. How do we improve the visibility of our extension programs? Are numbered extension articles, YouTube, narrated PowerPoints, farm visits, or other avenues the most appropriate for reaching clientele?
4. Increase productivity of graduate students in terms of decreased time to completion and publication production. Evaluate the optimal number of credits required for PhD students, and the number and type of classes offered to graduate students.
5. Develop a plan to upgrade equipment in the Agricultural Machinery Research Laboratory (AMRL).

Accreditation Status

The undergraduate program (Biosystems Engineering) is accredited through ABET. The on-site review was October 30-November 1, 2016 and the final ABET statement was to accredit to September 30, 2023.

Mission

Serve and benefit the people of Kentucky and beyond through learning, discovery, and engagement in engineering for food, energy, agricultural, biological, and environmental systems

Vision

Be recognized and valued as:
A critical information source to clientele because we:

- are the primary source of engineering expertise for solving contemporary problems of vital social and economic importance to the state and beyond;
- are responsive to clientele needs;
- are catalysts for positive, innovative technological change; and
- strive to enhance the quality of life for our citizens.

A leader because we:

- develop and disseminate relevant engineering knowledge;
- utilize multidisciplinary and multi-institutional team approaches to problem-solving; and
- design and implement cutting-edge undergraduate and graduate instructional programs.

A role model for all similar programs because we:

- achieve excellence and balance in our instructional, research, and extension programs; and
- value faculty, staff and students who work cooperatively to foster excellence.

Department Organizational and Administrative Structure

The Biosystems and Agricultural Engineering (BAE) Department is fortunate to enjoy a structure where our undergraduates are in a position to take advantages of opportunities in both the Colleges of Agriculture, Food, and Environment and the College of Engineering (Figure 1). The department is one of fourteen in CAFE and one of eight in the College of Engineering.

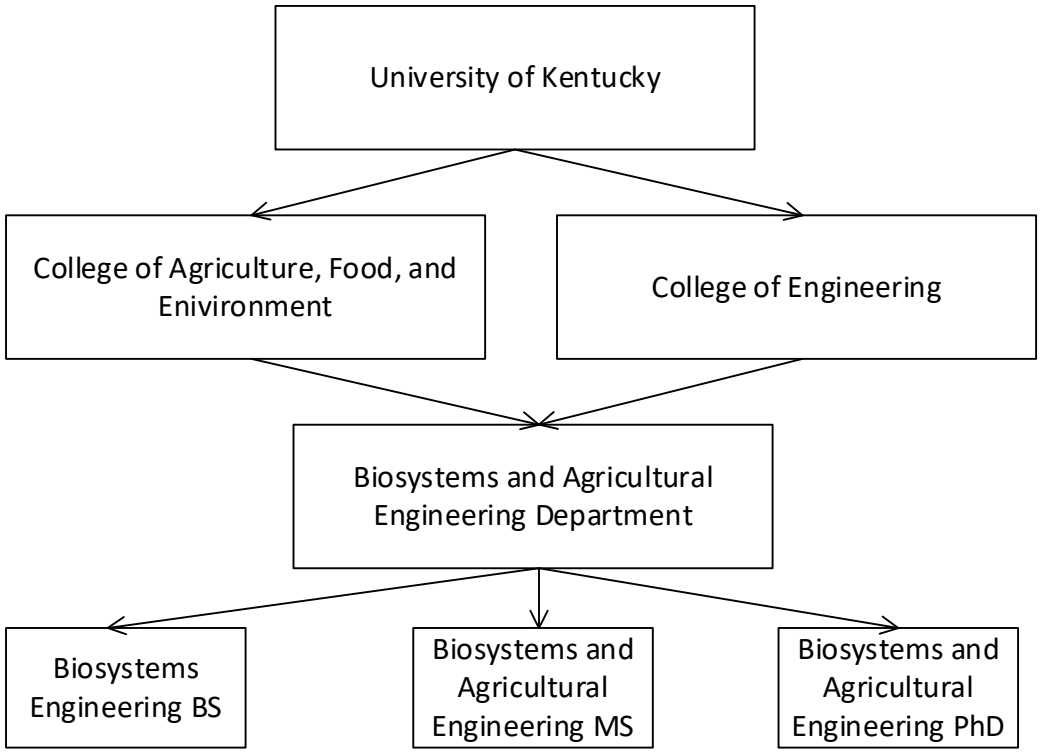


Figure 1. Organizational Administrative Structure of the Biosystems and Agricultural Engineering Department.

Degree Programs and Student Learning

In accordance with the Accreditation Board for Engineering and Technology (ABET), the BAE undergraduate program is accredited under programs in the College of Engineering, and as such our students are enrolled in and receive degrees from the College of Engineering. Funding for undergraduate instruction in the BAE program is borne by the College of Agriculture, Food, and Environment. Additional benefits that accrue to the BAE program are the extended scholarship opportunities for BAE students in both colleges, and an expanded pool of entering students from recruiters in either College. Within the Department, the Director of Undergraduate Studies, Dr. Czar Crofcheck, works to ensure that students are progressing with regard to the timely completion of degree requirements, and that the curriculum is administered in keeping with University, College, and accreditation requirements.

The Graduate degree program is administered through the Graduate School. Support for graduate students is derived from several sources including tuition scholarships from the Graduate School, tuition and graduate assistantships from industry, state and federal resources provided through the College of Agriculture, Food, and Environment. Dr. Donald Colliver, Director of Graduate Studies, is responsible for tracking the progress from the application process through to completion of degree requirements in keeping with the policies of the University, Graduate School, College, and Department.

In addition to the above degree responsibilities, the BAE program also provides service-related instruction for other degree programs within the College of Agriculture, Food, and Environment, which are further described below.

B.S. Program

The Biosystems Engineering curriculum meets the requirements set forth in *ABET Criteria for Accrediting Engineering Programs 2016-2017*. The self-study prepared for our recent accreditation visit presents a listing of the basic curriculum of the Biosystems Engineering Bachelor of Science program by semester. Required UK courses in calculus, and basic sciences total 44 semester credits and therefore meets and exceeds the 32 credits required under ABET Criterion 5. Similarly, the UK program curriculum requires a total of 49 semester credits of engineering science and design courses (minimum possible and still receive a degree), also meeting and exceeding the 48 credits required by Criterion 5. The balance of program curriculum requirements are writing and oral communication (9 credits), university social studies, humanities and cross-cultural requirements (15 credits) and one free supportive elective (3 credits). The BAE program received a full 6-year accreditation as of July 1, 2017. A copy of the self-study report utilized by the review team is available at the following URL: www.uky.edu/bae/sites/www.uky.edu.bae/files/BAEUKSelfStudyReport2016Final.pdf.

The BAE program requires students to complete a two-course, four-credit capstone design sequence. Students receive instruction in preparing and delivering technical oral presentations and are required to present four formal presentations of their design work (proposal, preliminary design, progress, and final design). Students are assigned to three- or four-person teams and select problems submitted by faculty advisors. The student teams research the problems and propose design solutions, specifying measurable design requirements. Design solutions are developed and presented for evaluation. After responding to recommendations of the faculty advisors and the instructor, design prototypes are fabricated or constructed. The student teams design and conduct experiments whereby the prototypes are tested to assess the attainment of design requirements. Student teams prepare a final design report, as well as design drawings and specifications.

The capstone design sequence consists of 1 hour per week of lecture and two hours per week of team collaboration. Instruction is presented in team roles and teamwork, technical oral presentation, technical writing, design modeling, design analysis, estimating design costs, selection of design materials, design reliability, statistical hypothesis testing, engineering ethics, environmental protection, design safety, multidisciplinary design teams, and other topics. Students evaluate themselves and their peers' relative contributions to the design effort. The faculty advisors meet with the design teams throughout the two-semester period to offer suggestions and advice.

The BAE student branch encourages students to join one of three professional societies, namely American Society of Agricultural and Biological Engineers (ASABE), American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) or Institute of Biological Engineers (IBE). Regular biweekly meetings of the student branch are held during the academic year, with officers elected to represent the Engineering Student Council and the Agriculture

Student Council. Faculty involvement with student branch activities includes facilitation of meetings and topics, assistance with fund-raising, and organization of annual regional trips (typically the Southeast Regional Student Rally and the Midwest Regional Student Rally). Each year a different faculty member is the primary advisor, with prior year and next year advisors also involved for continuity.

Students have also been actively involved in the annual ASABE ¼-Scale tractor design competition. This competition draws membership from the full array of BAE undergraduates, not only those with a machinery systems focus. They are involved in all aspects of the project, including securing the majority of direct expenses. Several faculty and engineers on staff assist the students.

The BAE Department has an excellent record of placing its graduates in industry. For example, recent graduates specializing in the Machine Systems Automation area found employment with John Deere Company, CNH America LLC, LinkBelt, Altech Industries, Cummins, MAC engineering, and Toyota Motor Manufacturing. Similarly, students from the Controlled Environment area have been employed by Big Ass Solutions, and several local engineering/HVAC firms. Students specializing in Food and Bioprocess Engineering are employed with Haskell Construction, Keurig Green Mountain, Algood Food Co. Graduates who specialized in the Bio-Environmental option of our program are employed in a variety of consulting firms in the Central Kentucky region including Fuller, Mossberger, Scott and May (FMSM), Tetra Tech EM Inc., CDP Engineers, GRW Engineers, and Mac Tech. Our bioenvironmental alumni have also found employment at the Kentucky Division of Water, Army Corps of Engineers, Kentucky Division of Air Quality, and Kentucky American Water. Many BAE graduates pursue graduate degrees (typically either in Biosystems Engineering or in Biomedical Engineering), obtain an MBA, or attend medical school. We have alumni in graduate programs here at UK, but also at the University of Michigan, University of Louisville, and University of Wisconsin. We have alumni in medical school at the University of Kentucky, University of Louisville, and the University of Cincinnati. Our graduates who also obtained an MBA are working at places like Syngenta Ag, Macy's, UPS, and CTI Clinical Trial and Consulting Services. Recently, we have been placing more graduates at technology companies (Epic, Madison, WI) and utility companies (Schneider Electric, Pleasanton, CA and Owen Electric, Dry Ridge, KY).

M.S. and Ph.D. Programs

The BAE Department offers programs leading to both M.S. and Ph.D. degrees in Biosystems and Agricultural Engineering. The official graduate student enrollment in Fall, 2017 was a total of 29 (11 PhD and 14 MS), roughly 65% of whom are domestic students. A total of 56 (11 PhD and 45 MS) graduate degrees have been awarded over the past five years.

To aid in graduate student recruitment, our department initiated a graduate student recruitment weekend in Spring 2010. All BAE faculty are members of the Graduate Faculty, with nearly all being full members. BAE faculty are involved in instructing a total of over 20 regular graduate courses that collectively provide advanced information on all specialties within the department.

Each BAE faculty member is actively engaged in graduate programs from the standpoint of advising, graduate committee service, graduate instruction, or a combination of activities.

BAE graduate students are supported by assistantships through a combination of external and internal funds. Additional support is provided in the form of tuition scholarships (most of which are borne through Dean's credits). Graduate students have access to the range of available Departmental support: current computing hardware and software, wireless internet access, laboratory facilities and equipment, technician and engineering support, fabrication support, and excellent office space.

Service Courses

The BAE Department teaches a variety of service courses in support of the greater college mission of educating students to work in the food and fiber industries, along with protecting the natural resource base. Examples of such coursework include AEN 103 Basic (Principles of Surveying), primarily taken by Landscape Architecture majors. Other courses include, AEN 220 (Farm Tractors and Engines) and AEN 252 (Farm Shop) and AEN 463G (Agricultural Safety and Health) primarily taken by Agricultural Education majors, AEN 340 (Principles of Food Engineering) for Animal/Food Science majors, and AEN 462 (Residential and Commercial Irrigation Design) for Plant and Soil Science majors.

In 2015, the BAE Department started offering a 3-credit course in Brewing Science and Technology (AEN 341). The course has been very popular with students and is an elective in the Distillation, Wine and, Brewing Certificate.

Technical Systems Management Minor

The department has primarily focused on the Biosystems Engineering program. However, in the previous six years we have pursued a non-engineering degree option. Technical Systems Management (TSM or similarly named) is a program that most of our sister Biosystems and Agricultural Engineering departments have offered for many years. The University of Kentucky has not offered this program before, and we have investigated this opportunity. We originally offered the program as an Individualized Agriculture Degree through CAFE. Allowing the students to enter the program as Freshmen and finish with a BS degree. Due to resource constraints we are finishing the students who enrolled in the Individualized Agriculture Degree, but have now focused on developing a minor in TSM.

Offering a minor in TSM would allow us to grow the program if the minor is successful and further resources become available. TSM links agricultural, environmental, manufacturing, and machinery theory with industrial practice, providing business and management skills from a hands-on, engineering point of view. The technology-rich TSM curriculum allows STEM/STEAM (STEM + Art/Design) students to continue to learn by doing, promoting a student-centered educational experience. The TSM undergraduate minor combines classroom education and hands-on experience because of an awareness of the United States' reported "skills gap" and also because, as an applied engineering department, our faculty expertise strongly lends itself to teaching these technical skills. In our technology-rich environment,

students will learn practical, theoretical, and managerial skills, including how to prevent and solve problems, make decisions, and manage teams.

Most of the TSM courses are offered as AEN courses that are service courses for other departments within CAFE. The additional teaching load related to the minor is expected to be slight.

Stream and Watershed Science Certificate

The Stream and Watershed Science Graduate Certificate provides students with an understanding of the complex physical, biological and social systems involved in stream and watershed related issues. This certificate integrates many of the disciplines and professional areas of engineering, science, policy and management in the study of stream and watershed systems and the successful management of these systems. Students completing the certificate program will have a better understanding of research findings from diverse specialties and the field application of these findings in the management of streams and watershed systems.

Initiatives

During the past five years the department has addressed a number of needs and recommendations identified by the previous departmental review. We have focused on hiring and developing new personnel that addresses many of the recommendations. This has included the hiring of seven assistant professors, one professor, and one lecturer since the previous review. The lecturer provides teaching and professional advising. In addition, three individuals were hired to assist with laboratory management and staff supervision. We have also added an Extension Associate for Distance Learning to coordinate the web development and internal/external communications. These hires helped fill the primary gaps in the previous review.

Faculty Expertise

The previous report stated that some areas have decreased expertise, specifically Machine Systems, Controlled Environment, and Bioenvironmental. Two of the faculty hires were in Machine Systems, two in Controlled Environment, one in Bioenvironmental, two in Food and Bioprocessing, and one lecturer.

The previous report identified the turnover in faculty affiliated with the Machine Systems specialization. We have addressed that by hiring two new assistant professors (Drs. Dvorak and Sama) within the Machine Systems specialization. As a result, we have been able to teach the senior level core class every Fall semester (BAE 417 by Dr. Stombaugh) and offer three technical electives, one each semester on a three semester rotation (BAE 515, BAE 599 “Component Design” and BAE 599 “Control of Off-Road Vehicles” by Drs. Dvorak and Sama). Paperwork for both BAE 599 courses have been submitted to the University to be formalized.

BAE 417 is offered in the Fall semester and the course had to be offered to allow students to graduate. Between Fall 2013 and Fall 2017, 129 students have taken the course. During the same period, 71 students have taken the technical electives (BAE 515 and both BAE 599 courses). At

this point the undergraduate Machine Systems specialization has enough courses for students and faculty support.

The report also noted the lack of faculty support in animal facilities and greenhouse systems. Two extension specialists were hired to address needs in the Controlled Environment specialization. Dr. Hayes has worked extensively on confined animal housing and although she does not have a greenhouse engineering focus, her background on confined animal operations would aid in greenhouse design as needed. Dr. Hayes will teach the senior level course BAE 427 Structures and Environment Engineering. This was previously taught by an adjunct faculty member. Dr. Jackson was also hired in the Controlled Environment specialization and will aid in livestock facility design and teach a course on Precision Agriculture and GIS applications.

The required and core courses are offered on a routine schedule (Appendix A – Undergraduate Courses) that allows students to meet graduation requirements. New faculty hires have made this possible.

Two research facilities managers were hired over the previous six years. One oversees the chemistry laboratories (Jeff Smith) and the other oversees the other non-chemistry laboratories (Alex Fogle). During this period, equipment was upgraded in the chemistry labs for water quality analysis. Alex Fogle has considerable experience with water quality analysis and field experiments related to water quality. The upgrades in equipment and staff addresses support for the Bioenvironmental faculty.

Student Support

We had observed a large increase in undergraduate enrollment between 2012 and 2015. For the 2016-2017 academic year, the College of Engineering implemented a common First Year Engineering Program (FYE). This eliminated BAE 102 “Intro to Biosystems Engineering” and BAE 103 “Energy in Biosystems” and caused BAE 201 “Economic Analysis of Biosystems” to be moved to the Junior year. Therefore, BAE 200 “Principles of Biosystems Engineering” is the first course that our students have in the program during the Fall semester of their sophomore year. There are 39 students enrolled in BAE 200 during Fall 2017, which is lower than previous years for the second year. BAE 202 “Statistical Inferences for Biosystems Engineering” is offered the Spring semester of the Sophomore year and has 37 students enrolled.

Of the 37 students enrolled in BAE 202, 27 were in BAE 200, or 73% of the students were retained between the two courses. It is difficult to compare enrollment in Fall 2017 with previous years due to implementation of the FYE program. We are actively involved with the FYE program and will evaluate how it impacts our program moving forward.

Many of our students, especially incoming, identify with the Pre-Biomedical specialization. The Biomedical Engineering Department (BME) at UK offers an undergraduate minor and graduate degrees. As a result, the students in Pre-Biomedical from our department will obtain a BS in our program and continue to graduate school. Biomedical engineering is somewhat unique in that at least an MS is typically required for entry level jobs. BME has a new department chair and the College of Engineering has an interim Dean, changes in the BME program could occur.

Currently, Drs. Crofcheck and Montross have discussed options with Dr. Zhang (new chair of BME) on options for collaboration between the two departments. The chair of BME feels strongly about creating a new BS in biomedical engineering. This could have an impact on our undergraduate student numbers.

Graduate Program

Attracting talented graduate students has been a difficulty for numerous years. To help attract high caliber graduate students, we have a two day Graduate Student Recruitment Event in January. Potential students apply and based on their resume and transcripts, we will pay for them to visit the department. This has been successful in attracting a broader pool of graduate students. Funding has, and will continue, to be an issue on the graduate program. Additional grant funding is required to grow the program.

The department continues to encourage graduate students to publish with our departmental awards for publishing. Publication rates have increased with the hiring of new faculty members the past six years. Our goal is for every faculty member to contribute at least 2 refereed journal articles per year. According to reported figures for the 128th KAES Annual Report for calendar year 2015, the Department had 14 publications from our 16 faculty members and 20 graduate students (12 MS, 8 PhDs) in the BAE program in 2015-2016. According to internal tracking for calendar year 2017, the Department had 37 publications from our 18 faculty members and 23graduate students (13 masters, 10 PhDs) in the BAE program in 2016.

Name Recognition

The BAE department has long struggled with name recognition. There are agricultural, biological, biosystems, biological systems, and other variations in department names for similar departments across the US. Lack of name recognition also impacts our students. Employers will frequently ask to interview mechanical, electrical, or civil engineers and do not recognize the potential of our graduates. We have worked with the Engineering Career Development office to make sure employers are aware of Biosystems Engineers as potential employees. Interview skills and resume building are covered in the senior seminar class (BAE 400) to help address this issue.

Faculty in the department work on multidisciplinary teams and within CAFE their expertise overlaps multiple commodities. Most Extension programs are led by commodity specific specialists and our department does not receive as much recognition. We have two new assistant professors in the Extension title series who are more focused on livestock systems, but their expertise would cross commodities. Extension work is changing and we will mentor them to make sure their work is recognized within the College and across the state.

Extension

Extension FTE’s have fluctuated over the past six years and most Extension specialists teach at least one course per year. Teaching helps faculty stay engaged with students and that aids in the recruitment of undergraduate and graduate students for their program. Some extension faculty (Tim Stombaugh) have developed recorded lectures to aid in content delivery and utilize alternative teaching schedules. The department philosophy has been that teaching is important

for extension specialists and that innovative methods are available to allow for effective teaching and extension delivery.

Alternative extension delivery methods need to be further developed. Farm visits are time consuming, expensive, and difficult to quantify for promotion and tenure. In February 2013, we hired a Senior Extension Associate for Distance Learning (Karin Pekarchik) that assists faculty with publications, web site development and distance learning. The role of distance education and alternative extension delivery methods are still evolving.

Publications and Plans

An extensive overhaul of the website, including Extension pages, was undertaken during 2013 and into 2014. Broken links were corrected, and page navigation was redesigned to allow for easier access by users. Once the basic mechanisms of the website were corrected, an archive project of outdated plans and publications was initiated. Outdated materials —plans and publications over five years old—were moved to an archive page on the website. In addition to moving the older publications and plans to the archive, a warranty disclaimer was added to each individual plan or publication. The warranty disclaimer is found both on the webpage and then on the first page of the PDF, in instances where there is an attachment that can be downloaded

Numerous extension publications and plans have become very dated. Some may recommend materials and actions that are outdated due to changes in materials, safety issues, and practices. Since the previous review, we moved the older publications and plans to an archive, and a warranty disclaimer was added to each individual plan or publication. The warranty disclaimer is found both on the webpage and then on the first page of the PDF, in instances where there is an attachment that can be downloaded.

Credit for Scholarly Work

The department encourages graduate students to publish with our departmental awards for publishing. The award is $250 for the first submitted article and an additional $250 when the article is published. Further awards of $250 are made for each additional published article. This has resulted in 26 publications and $12,000 in awards being provided since 2010. We need to find methods to continue funding this incentive and continue to increase scholarly productivity.

In addition, we have created a policy that a published paper can count as course credit. Currently, PhD students are required to take 60 credits beyond the BS degree. The number of credits required likely interferes with time for other activities, such as grant writing, publications, and teaching. Graduates with a PhD traditionally go into academic appointments where refereed journal articles are very important for them to obtain job interviews.

The department chair has asked faculty members to set publishing goals, and to hold people accountable for the goals they made. Assessment is the number of journal articles per research FTE. The publication trends will likely change due to turnover in the faculty ranks the past six years. We have had seven faculty departures and have been able to rehire nine faculty members since the previous review. Seven of the new faculty were hired at the assistant professor level

and one lecturer. This will have a significant, positive impact on the department's research, teaching, and extension metrics.

With two new faculty hired in the extension title series, we need to develop procedures to establish what constitutes as scholarly work. There are many dated, but potentially still useful, plans and publications that we have archived on the website. Scholarly work from extension faculty could include: minor revision of dated publications, major revision of dated publications, or development of completely new publications. Appropriate credit for the three tiers of publication needs to be established. Traditional numbered extension publications are likely not as valuable to clientele today, but have been valued by the College for annual performance reviews and promotion and tenure decisions. New, refereed scholarly work could include traditional numbered extension publications or alternative platforms (YouTube). Scholarly work using alternative platforms need to include methods to allow for peer review and appropriate credit provided for the level of work.

Department Facilities and Equipment

There are three new staff members who oversee various aspects of the facilities and equipment for the department. There are new supervisors for the Agricultural Machinery Research Laboratory, the wet chemistry labs in the Barnhart Building, and a supervisor for the dry lab spaces in the Barnhart Building. The three supervisors coordinate maintenance of equipment, use of space, and access to equipment. An annual dumpster day was started to help with organizing, cleaning, and keeping laboratories looking presentable. With the recent faculty turnover and new hires, opportunities exist to update equipment, dispose of obsolete materials, and repurpose laboratory space.

The Agricultural Machinery Research Laboratory (AMRL) has tremendous personnel and abilities for fabrication and design of equipment. Traditional machine design and fabrication (i.e. large agricultural machinery) is less of an emphasis today compared to when the facility was built. The AMRL is still very valuable for producing smaller scale laboratory scale research equipment. However, the facility is relatively dated and is in a desirable location for the Athletics Department. Plans need to be developed to upgrade the equipment and potentially move the location if Athletics acquires the space.

Overview of progress since the last review

Our response to the recommendations from the previous report is detailed further in this self-study. The recommendations and implementation of each are shown as follows:

Departmental recommendations for improvement	
Recommendation	Implementation Status
1. Devise a plan to support machine systems automation engineering in the long run	Two assistant professors focused on Machine Systems were hired. Core class taught every Fall semester and three technical electives were created and one offered each semester.
2. Determine future department direction based on current areas with strong faculty support and identify areas that need more support.	Two assistant professors focused on Controlled Environment specialization were hired. The core senior level class will be offered each Spring and other classes will be offered.
3. Publications or building plans that still have some value should be considered for revision if faculty with expertise in the area are still an active part of the department. Original authors should be a consideration for making a revision, if available. Web links should be reviewed so that the number of broken links to internal publications and plans are resolved.	We hired a Senior Extension Associate to design the web site and provide assistance to faculty on web page design. A disclaimer was added to the old plans.
4. Lab facilities are an asset to the department, and a mechanism should be adopted for better coordination of labs and equipment.	Two Research Facilities Managers were hired to oversee the wet (chemistry) and dry labs in the building.
5. Growth areas in general should be evaluated to determine the level of support and specialty courses needed to accommodate students.	New faculty hires have reinvigorated a number of areas and allowed us to offer and accommodate undergraduate students.
6. The department should help students to develop ways to market themselves by using more recognizable terms for résumés and other forms of communication with prospective employers	Assignments in the senior seminar course help with resume development and selling themselves to potential employers.
7. Extension specialists need to explore current options for program delivery that could reduce unnecessary travel and that would accommodate teaching schedules	Dr. Stombaugh has developed alternative delivery methods for courses. This will be helpful for the two assistant extension professors we have recently hired.

8. The department needs to strongly encourage publication as a visible way of documenting activity. The department should send a consistent message to graduate students regarding publication of their work and explore a publishing incentive program like that used by the UK Entomology Department as long as funding sources are available	The retirement and refilling of a number of faculty lines should help with refereed journal publications. We have implemented a publishing incentive similar to Entomology for graduate students.
9. Movement of equipment needs to be monitored to reduce inventory burden. All faculty and staff are encouraged to keep inventory requirements in mind to reduce current problems locating equipment and computers.	Alex Fogle has assumed inventory responsibilities and most equipment is being located in a timely fashion.
10. Labs should be maintained in a presentable manner (while maintaining consideration for the need to be productive) so that they serve as a safe environment and are not a detriment to student recruitment	With the turnover in faculty, labs are being cleaned and equipment put into storage. The wind damaged storage building at North Farm is making storage outside of the department difficult.

Department Resources

Financial Resources

The department is supported by funds through the College of Agriculture, Food and Environment. Individual's in the department receive funds from external grants, Hatch/multistate accounts, income accounts, and gift funds. The department budget is in the form of state and federal money, which is divided into teaching, research, extension, and operating categories. Table 1 presents the summary of the most recently completed fiscal year. The total budget was approximately 3.5 million dollars with 79% of the money from state sources and 21% from federal funds (primarily Hatch, multistate, and Extension accounts). The majority of the budget was allocated to research (50%), followed by extension (30%), teaching (15%) and operating (6%).

Table 1. Departmental budget for the 2016-2017 fiscal year (as of July 1, 2016).

	Teaching	Research	Extension	Operating	Total	%
State	513,721	1,348,054	748,265	188,264	2,798,304	79
Federal		407,021	295,744	36,065	738,830	21
Total	513,721	1,755,075	1,044,009	224,329	3,537,134	100
%	15	50	30	6		

For perspective, Table 2 shows the departmental budget from the 2011-2012 fiscal year. The total budget was 3.4 million dollars with 79% from state sources and 21% from federal sources. The total budget in the 2011 compared to the 2016 fiscal year was within 96,000 dollars. The slight increase in 2016 relative to 2011 was due to salary increases for faculty and staff that were largely offset by budget cuts. The percentage of the budget allocated to teaching in fiscal year 2016 has increased in line with the increase in undergraduate student numbers and increase in faculty members.

Table 2. Departmental budget for the 2011-2012 fiscal year (as of July 1, 2011).

	Teaching	Research	Extension	Operating	Total	%
State	380,006	1,432,525	704,203	184,609	2,701,343	79
Federal		388,899	314,874	36,065	739,838	21
Total	380,006	1,821,424	1,019,077	220,674	3,441,181	100
%	11	53	30	6		

In fiscal year 2016-2017, funds were available in the broad budget categories summarized in Table 3. The majority of the department budget is committed to faculty and staff salaries. There are two partially open faculty lines from two faculty members who are in post-retirement. There is approximately 74,000 in open staff salaries. It should be noted that the College pays the benefits for budgeted faculty and staff lines.

Table 3. Primary budget categories as of July 1, 2017.

Item	State	Federal	Total
Faculty salaries (filled)	1,889,329		1,889,329
Faculty salaries (open)	74,553		74,553
Staff salaries (filled)	608,288	490,487	1,098,775
Staff salaries (open)	26,588	47,412	74,000
Graduate students (stipends and tuition)	11,282	164,866	176,148
Operating expenses	188,264	36,065	224,329
Total	2,798,304	738,830	3,537,134

Table 4 summarizes the allocation of operating funds in fiscal year 2016-2017. There are a number of expenditures that were not typical due to the grant and vacancy salary savings in that year. Of the $503,210 spent on operating expenses, a total of $194,773 in lab and fabrication equipment, upgrade of welding lab, and replacement of departmental vehicles were purchased that would not be recurring. This amounted to 39% of the operating budget. The right two columns of Table 4 show the operating funds without the non-recurring expenses. The largest category was lab and fabrications supplies at $60,551 or 19% of the operating budget. Other significant categories were computers/software ($42,555 or 14% of the budget), communications ($40,817 or 13% of the budget), non-ASABE travel ($38,128 or 12% of the budget), and ASABE travel ($33,080 or 11% of the budget). It should be noted that the communications expense is a fixed, required cost from the University.

Table 4. Utilization of operating funds for fiscal year 2016-2017. Numbers include operating budget, grant salary savings, and vacancy savings.

	Total spent		Excluding non-recurring items	
Category	Amount	%	Amount	%
Lab and fabrication equipment[1]	91,401	18	0	0
Classroom and teaching labs[2]	71,630	14	21,630	7
Lab and fabrication supplies	60,551	12	60,551	19
Vehicles replaced[3]	49,972	10	0	0
Computer/software	42,555	8	42,555	14
Communications	40,817	8	40,817	13
Travel[4]	38,128	8	38,128	12
ASABE travel	33,080	7	33,080	11
Other[5]	31,606	6	31,606	10
Vehicle fuel and maintenance	24,518	5	24,518	8
Duplicating	15,304	3	15,304	5
Office supplies	3,648	1	3,648	1
Total	503,210	100	312,219	100

[1]Includes 64,603 for environmental chamber and 26,798 for saws in shop

[2]Includes 50,000 for upgrade of welding lab in Barnhart Building and 3,400 for chairs in computer lab
[3]Two replacement departmental vehicles
[4]All non ASABE travel
[5]Includes page charges, tuition, professional insurance, recruiting, postage, building maintenance, and parking

A major financial category not in the budget is graduate student tuition and equipment repair. The Graduate School provides tuition credits for grants that do not pay tuition. These tuition credits were worth $160,433 in fiscal year 2016-2017. Tuition charges from the operating budget would create significant difficulties. With the large number of assistant professors purchasing equipment with startup funds, repair and maintenance of the equipment could be problematic. There are minimal operating funds to pay for tuition or equipment repair.

Physical Resources

The Department of Biosystems and Agricultural Engineering has been housed in the C.E. Barnhart Building since 1990. This is located in the College of Agriculture, Food, and Environment complex south of central campus. The BAE Department has 4,600 m^2 (50,000 ft^2) space in offices, classrooms, and laboratories. It is approximately a 20 minute walk to the College of Engineering buildings. The Barnhart Building four-story office tower is shared with the Department of Agricultural Economics (top two floors). Each floor has a gross area of 600 m^2 (6,500 ft^2) and contains central rooms and 21 perimeter offices. The University maintains one classroom on the second floor; the Department maintains a computer laboratory on the first floor (18 personal computers, networked printers, and restricted access for BAE students, staff and faculty), and an engineering design laboratory (Room 236) on the second floor that is used heavily for instruction. This room includes internet access, computer-based projection, and audio-visual equipment.

Attached to the Barnhart office tower is the department's laboratory facilities, featuring 3,400 m^2 (36,000 ft^2). These laboratories include a long (>100m) central hallway with electronics, shop, wet chemistry, material properties analysis, and fermentation technologies on one side and large high-bay laboratories for controlled environment systems, grain handling, machinery systems, food engineering, biomechanics, and bioprocess engineering on the other side. Two large arms off this central corridor provide additional labs housing controlled temperature-humidity units, fabrication areas for student and research projects, and a series of bays for soil and machinery interaction testing, surface and sub-surface hydrology, and waste management. One laboratory (Lab 153) is dedicated to electronics and instrumentation instruction.

The Department also maintains the Agricultural Machinery Research Laboratory (AMRL), a steel structure located near the football stadium. Four full-time staff are employed and housed in this facility, providing key engineering, fabrication and machining support for the wide variety of research projects. Typically, four to twelve undergraduate students are employed on various projects in this facility. Adjoining the AMRL is an HVAC training facility. The AMRL and Heating Ventilation and Air Conditioning (HVAC) Training facilities are now connected through

that addition of a 3600 ft^2 of enclosed space between the two existing structures. The new space will be utilized as a wash bay and paint preparation area.

The Department has storage space located at both the North Farm and Woodford County Animal Research Center. Space at the North Farm is primarily dedicated to storage of surplus equipment, or equipment where the frequency of use is insufficient to justify space in the C.E. Barnhart Building. Storage at the Woodford County Animal Research Center is primarily for agricultural field machinery.

Human Capital Resources

The department personnel total 82 as of July 1, 2017. The distribution of personnel is summarized in Table 5. The faculty is composed of 17 tenure track faculty and 1 lecturer. There are 18 full-time staff, 10 temporary/grant funded staff, and 26 graduate students.

Table 5. Summary of department personnel as of July 1, 2017.

Classification	Number
Tenure track faculty	17
Lecturer	1
Post-retirement faculty	3
Adjunct faculty	6
Full-time staff	18
Temporary/grant funded staff	10
Post-doctoral scholars	1
Graduate students	26
Total	82

Our demographic profile is shown in Table 6. The demographic profile is consistent for an engineering department. The number of non-Caucasian and female faculty have grown since the previous review.

Table 6. Personnel diversity as of July 1, 2017

Classification	Number of personnel	Number of non-Caucasian	Number of female
Faculty	17	3	4
Graduate students	26	9	5
Full-time staff	19	2	4
Total	62	14	13

The faculty size was constant at 15 from 2013 to 2016, however it has increased to 19 in 2017. The number of research/teaching faculty grew slightly in 2017 with new hires and due to the increased teaching load with larger undergraduate numbers.

Table 7. Faculty size between 2012-2017 (as of June 30). Any full-time faculty member with research, instruction, or extension DOE in the department was included.

	2012	2013	2014	2015	2016	2017
Extension	6	6	6	6	6	7
Research/teaching	8	9	9	9	9	12
Research title	0	0	0	0	0	0
Total	14	15	15	15	15	19

The instruction, research and extension work of the faculty has varied slightly over time (Table 8). The full time equivalent (FTE) faculty devoted to instruction, research, and extension were 3.3, 6.1, and 3.9 in 2013. Or approximately 22, 41, and 26% of the faculty time was focused on instruction, research, and extension in 2013, respectively. The faculty effort remained relatively constant until 2017 when new faculty were hired. In 2017, 5.1, 7.5, and 4.4 FTE were devoted to instruction, research, and extension. This corresponds to 27, 40, and 23% of the time to instruction, research, and extension. The increase in percentage of time allocated to teaching was due to the increased number of undergraduate students that we have seen recently.

Table 8. FTE splits between 2013-2017 (as of June 30). Does not include post-retirement appointments.

	2013		2014		2015		2016		2017	
	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Instruction	3.3	22	3.8	25	4.1	27	4.3	29	5.1	27
Research	6.1	41	5.6	37	5.5	37	6.6	44	7.5	40
Extension	3.9	26	4.4	29	4.8	32	3.5	23	4.4	23
Administration	1.2	8	1.2	8	0.7	5	0.6	4	1.5	8
Professional development	0.5	3	0.0	0	0.0	0	0.0	0	0.5	3
Total	15		15		15		15		19	

Trends in the rank and title series of the faculty are shown in Table 9. The number of full professors in the research/teaching title series has fluctuated between 4 and 6 since 2011. Associate professors were also consistently fewer than 2. The most signficiant trend is the number of assistant professors. In 2011, there was 1 assistant professor. In 2017, there are 5 assistant professors and 1 lecturer. The rank of faculty in the extension title series has followed a similar trend. The number of full extension professors has remained relatively constant between 3 and 5 since 2011. Similarly, the number of associate extension professors has been between 1 and 3. In 2016-2017, there were 2 new assistant extension professors hired. There has been a significant shift in the faculty ranks since 2011. In 2011, there were 2 assistant professors out of 15, or 13% of the faculty. In 2017, there were 7 assistant professors out of 19, or 37% of the faculty. This shift should help the department productivity.

Table 9. Faculty rank by rank and title series.

Research/Teaching	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Professor	5	5	4	4	5	6
Associate professor	2	1	1	2	1	0
Assistant professor	1	2	3	3	4	5
Lecturer	0	0	0	0	1	1
Extension						
Professor	4	4	5	5	3	3
Associate professor	3	3	2	2	1	2
Assistant professor	1	1	0	1	0	2

Faculty Recruiting

Faculty recruitment in BAE is done according to College and University guidelines. Effectively, a vacancy within the unit must exist prior to recruiting for a position. Some exceptions in the case of minority faculty recruitment exist, although the unit is still expected to find resources to support the new faculty line after a preliminary period sponsored by central campus. Accordingly, faculty recruitment has a long time-horizon. Current BAE faculty network with peers and colleagues nationally and internationally, and regularly attend technical presentations of potential hires at international professional meetings. Potential future faculty from within the student population are encouraged to consider graduate school at institutions other than UK.

Faculty and specialists regularly develop priorities for potential future hires. While a vacancy in an Extension Title Series position generally will be refilled with another Extension Title Series hire, the subject matter may be changed to better reflect current and projected needs. Faculty are deeply involved in all aspects of recruitment, interviews, and informal mentoring.

Faculty Retention

A formal faculty mentoring process has been established to guide Assistant and Associate Professors through the promotion and tenure process. This effort is currently overseen by a senior faculty member that Chairs the Promotion and Tenure Committee; other members include the Director of Undergraduate Studies, the Director of Graduate Studies, and the Chair. This committee was recently formalized as one of the Departmental standing committees. The intent was to formalize the review process to insure the timely completion of two and four year reviews as required within the University Administrative Regulations. An ancillary benefit is the now routine meetings between the Committee Chair and assistant professors where input from the faculty is summarized and provided to each assistant professor along with recommendations on how to shape their research, extension and teaching efforts to be more productive.

Staff Recruiting

The majority of staff recruitment, outside the administrative reorganization described elsewhere, is done by one or several faculty seeking to fill a particular need with grant funds. A limited number of funded technical support positions are available. Since the previous review, we have reorganized the management of the shop, wet labs, and dry labs with a supervisor for each area. Very recently, we have had some additional staff vacancies. We will develop a plan on what the greatest unmet

staffing needs are and how we can improve our staffing. Meanwhile, lapsed salary from these vacancies is being used to support other staff in transition between grants, and graduate student assistantships and tuition fees.

Faculty Expertise

Our department faculty are broken into four broad categories: food and bioprocessing, machine systems, bioenvironmental, and controlled environments. Not all faculty fit into a single category, but broadly the faculty are distributed according to Table 10. It should be noted that one lecturer is not included in the table. In terms of faculty, food and bioprocessing is the largest category with 6 faculty members. Machine systems and bioenvironmental are similar with 5 and 4 faculty members, respectively. The controlled environment is the smallest area due to a recent retirement, but in many cases faculty do not fit into one working area.

Table 10. Distribution of faculty by working area and title series (numbers do not include one lecturer).

Working area	Research/Teaching	Extension	Total
Food and bioprocessing[1]	5	1	6
Machine systems[2]	4	1	5
Bioenvironmental[3]	2	2	4
Controlled environments[4]	1	2	3
Total	12	6	18

[1]Adedeji, Crofcheck, McNeill, Montross, Nokes, Shi
[2]Dvorak, Peterson, Purschwitz, Sama, Stombaugh
[3]Agouridis, Edwards, Ford, Taraba
[4]Colliver, Hayes, Jackson

The expertise of the faculty is summarized in Table 11.

Table 11. BAE faculty members areas of expertise.

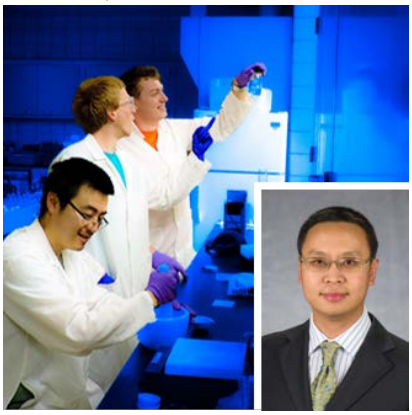
Akinbode Adedeji, Ph.D. 	The focus of the Food Engineering group in BAE is on underutilized grains valorization using extrusion processing, basic understanding of the composition and functionality of these grain macromolecules and how they change during various food processing stresses using molecular modeling. My research uses noninvasive methods, acoustic emission and hyperspectral imaging to determine food quality and assess safety. We also have the capability of using non-thermal methods (pulsed UV light and cold plasma) for ensuring food safety.
Carmen Agouridis, Ph.D., P.E., M.P.P. 	My program uses applied research to address current issues in the natural resources community, particularly in the field of ecosystem restoration as it applies to streams impacted by mining, urban or agricultural activities; wetlands; and mined land reclamation. My research also examines methods of improving stormwater management using green infrastructure such as rain gardens and stormwater wetlands, as well as novel approaches such as weep berms and woodchip bioreactors. Additionally, I work in the area of geospatial analysis as it pertains to environmental impacts from grazing livestock and identification of headwater stream types (e.g. ephemeral, intermittent, and perennial).
Don Colliver, Ph.D., P.E. 	I work with residential housing and environmental design; analysis and simulation of building envelope heat transfer and renewable energy production and use, and analysis of building design weather data. My principal research area is in the determination of appropriate design and operation of energy efficient and healthy buildings, and I have a special interest in solar energy. I am director of the Kentucky Energy Assessment Center, which is funded by the U.S. Department of Energy.

Czarena Crofcheck, Ph.D., P.E. 	My research emphasis is in bioprocessing, specifically downstream processing of value-added proteins and the conversion of biomass to chemicals and fuels. The conversion of agricultural and forestry biomass into value-added chemicals and materials holds great promise for increasing industrial sustainability and increasing markets available for U.S. producers. I also have focused on developing technologies for large-scale growth of algae for CO_2 mitigation purposes.
Joseph Dvorak, Ph.D., P.E. 	The focus of my research is investigating the machinery processes needed to enable a single human producer to effectively manage agricultural areas measured in hectares when variations occur at the sub-meter level. In particular, I have been studying this variability's effect on machinery power usage and methods to address these effects using hybrid drivetrains and alternative energy sources. I have also been investigating ways to control and operate the machinery at the necessary resolutions through multiple sensors embedded within larger pieces of equipment or the autonomous control of multiple smaller machines. The outcome of this research would enable more production using fewer inputs. This research represents a small part of the world-wide recognized "food, energy, and water nexus," and like the larger nexus, is composed of many interconnected components.
Dwayne Edwards, Ph.D., P.E. 	My research is in the area of surface water hydrology, water quality, and statistical analysis. I use plot, field, and watershed-scale studies and data to assess the impacts of both agricultural and urban activities on the quality and quantity of storm runoff. I am also involved in using simulation models to describe those impacts and to improve their usefulness by using statistical techniques to improve the quality of model predictions.

William Ford III, Ph.D. 	My current research area is in watershed-scale water quality assessment of natural and managed ecosystems. *M*y interests include study of 1) biogeochemical and physical processes impacting nutrient source fate and transport in streams and wetlands, 2) surface and subsurface nutrient runoff at the edge-of-field (EOF) in agroecosystems, and 3) quantifying the impact of management and restoration on nutrient cycling. My research methods include field and laboratory experimentation and monitoring utilizing the most up-to-date stable isotope tracer and nutrient sensing technology. I commonly employ analytical methods such as time series analysis, and numerical modeling. Deterministic watershed modeling is emphasized in my research program and incorporates development, application, and model performance evaluation to constrain uncertainties in estimating complex processes governing nutrient fluxes. The models serve as a tool for analysis of climate, land-use, and management/restoration scenarios.
Morgan Hayes, Ph.D., P.E. 	My research and applied extension programs look at improving the viability of livestock facilities in Kentucky. My major focus is examining ventilation management for improved temperature management and air quality, particularly in barns. I also consider usage of resources like water and electricity. Currently, I have research projects with a precision livestock farming focus, which involves monitoring animals to identify individual needs and behaviors.
Joshua Jackson, Ph.D. 	I work on precision management as it applies to livestock systems. My major emphasis is on the use of new technologies to improve livestock production systems. This includes the use of unmanned aerial vehicles to identify animals in a pasture and gauge their condition, developing alternative methods of electronically tagging and identifying cattle, and using facility design to enhance the care of livestock. I also work with GIS and AutoCAD to improve the design, construction, and modification of existing livestock facilities.
Sam McNeill, Ph.D., P.E.	I maintain a broad-based program that includes engineering aspects of grain production, harvesting, and post-harvest processing systems (handling, drying, and storage) and link new technologies with precision agriculture and grain

	production. My expertise has led me to share my work and gather data in Nigeria and Ghana.
Alicia Modenbach, Ph.D., P.E. 	I work closely with prospective and current students to ensure they have the information they need to make knowledgeable decisions about their academic journey in biosystems engineering. With a background in bioprocess engineering, I understand what it takes to be successful in an engineering program, and I look forward to helping students find their own paths to becoming successful engineers. I am particularly interested in exploring new ways to keep students active and engaged in the learning process, understanding how to better retain students, and developing and teaching innovative course curricula and programs that provide transformative experiences for students.
Mike Montross, Ph.D., P.E. 	My earlier research can be divided into three main areas: (1) drying and storage of grains and oilseeds, (2) behavior of granular materials during handling and storage, and (3) biomass collection, characterization, and processing.

Sue Nokes, Ph.D., P.E. 	I work on multidisciplinary projects aimed at converting bioresources into industrial chemicals (e.g. industrial enzymes) and biofuels (ethanol and butanol). My specific expertise is in solid-substrate fermentation and enzymatic conversion of plant biomass, including the mathematical modeling of kinetics and microbial metabolism. I am overseeing the development of activities and curricula to integrate science, technology, engineering, and math (STEM) education via the science of plant building blocks and sustainability in the context of food, water, and energy systems into secondary agricultural education classes, 4-H programs, and other educational avenues.
Mick Peterson, Ph.D. 	I am the Director of Equine Programs and Professor of Biosystems and Agricultural Engineering at the University of Kentucky. My research links traditional understanding of engineering mechanics and materials to the biomechanics of animals. My research emphasis is on the manner in which dynamic response can be used to characterize materials. I have worked on a range of equine and animal biomechanics topics including: the impact of exercise on bone density, the development of biomechanical models, durability of cetacean epidermis, the measurement of inertial properties of the equine forelimb, biomechanics of whale interaction with fishing gear, cetacean acoustic response, marine hydroacoustics and the kinematics of equine gait on treadmills and tracks. My greatest passion is for understanding of racing surfaces and equestrian surfaces. I collaborated with Dr. C. Wayne McIlwraith at Colorado State University to found the Racing Surfaces Testing Laboratory, a non-profit organization supported by the racing industry which provides research, testing and materials characterization services for the horse racing industry.

Mark Purschwitz, Ph.D. 	My specialty and personal area of interest is agricultural safety and health. I am involved with extension and applied research programs in agricultural safety and health, particularly in the prevention of traumatic injuries involving farm tractors and machinery. Promotion of ROPS (Rollover Protective Structures) retrofitting is important and aided by our online Kentucky ROPS Guide. Other focus areas include safety in grain handling and storage, and safety with ATVs (All-Terrain Vehicles.) In addition, I am developing safety-related materials for new and beginning farmers, specifically for use in the UK Farm Start program. I will also be conducting surveillance of agricultural and logging-related fatalities in conjunction with the Southeast Center for Agricultural Health and Injury Prevention here at UK.
Michael Sama, Ph.D., P.E. 	My research, on sensors and controls for precision agriculture, focuses on quantifying and addressing spatial and temporal variability in production environments with an emphasis on developing unmanned aircraft systems and variable-rate application technology. Current work includes multi- and hyperspectral remote sensing of moisture content, remote sensing of crop physical structure, spray nozzle control and drift mitigation, unconfined livestock health monitoring, *in situ* compost management, and grain harvesting logistics.
Jian Shi, Ph.D. 	My research goal is to understand and develop novel bioprocesses for the production of biofuels, bioproducts, and renewable materials by exploring the interface between chemistry, engineering and biology. Some of my specific research areas include 1) lignin valorization for chemicals and materials, 2) biomass conversion and product recovery, 3) waste treatment and conversion, and 4) bioprocessing for BioAg applications.

Tim Stombaugh, Ph.D., P.E. 	I conduct research and extension programs in the area of precision agriculture. In particular, I am interested in the performance of GPS receivers and associated systems such as automated steering systems and automatic section control. I have also worked with remote sensing platforms and field-based sensors.
Joe Taraba, Ph.D. 	My area of expertise is manure management methodologies, including microbial dynamics, composting and anaerobic treatment. I led a 10-year study of water quality impacts from livestock on the UK Animal Research Center. My team has developed a multidisciplinary research and extension program focused on compost-bedded pack (CBP) barn management. I have led the Environmental Stewardship session of a nine-session Master Cattleman Program. I am interested in biofilters and the impact of barn design on CBP.

Undergraduate Instruction

Undergraduate Recruiting

The focus of the department has been the BS in Biosystems Engineering. The Department recruits and educates a diverse and capable student population. Approximately 195 students are currently registered in our undergraduate program, with female and minority components of 45 and 18 %, respectively. The majority of our students are graduates of Kentucky high schools; however, we maintain a substantial component of out-of-state students and a few international students.

In 2010, the introductory class had approximately 60 students registered, up from about 25 students the year before. Enrollment in the introductory class was approximately 50 in 2011. In the Fall semester of 2016, the College of Engineering implemented a common First Year Engineering Program (FYE). As a result, the first class students will take in Biosystems Engineering is in their sophomore year. Two information sessions, specific to our program, are offered in the Fall semester for the FYE students. Attendance at the two sessions in 2016 and two

sessions in 2017 was approximately 60 to 100 students at each session. We will continue to refine the message presented in the hour long information sessions to improve student recruitment.

Our program benefits from student recruitment activities organized by both Colleges of Agriculture, Food and Environment and Engineering. The College of Engineering Office of Student Support Services visits several locations throughout Kentucky and bordering states annually to recruit qualified students. Interested students and their families are brought to campus for activities in which the various engineering programs present opportunities in their respective disciplines. The College of Engineering also hosts an Open House annually during Engineers Week at which BAE students and faculty demonstrate projects which are visited by potential students and their families.

The College of Agriculture, Food and Environment's Office of Student Success maintains an active student recruitment effort through the Director of Student Relations. Similar off-campus events are scheduled each year at which potential students can learn about our program. Potential students are invited to campus each year to meet with faculty and students from various programs in the College.

The Department had a Student Services Coordinator (SSC) who hosted students and/or family during various activities on campus. Faculty and/or the SSC identified opportunities to meet with prospective students that are invited to campus for a variety of programs. We believe these efforts have been essential in increasing the size of our incoming freshmen classes from approximately 20 students per year to the current 50-60 students. The SSC position was transitioned to a lecturer. This individual continues to help with recruiting and professional advising in addition to teaching duties.

Prospective students at the University of Kentucky must complete a prescribed curriculum of high school credits and complete the ACT standardized test. Selective admission criteria are then applied based upon the number of seats available. Table 12 presents the ACT scores of freshmen admitted to the College of Engineering and specifying BAE as their major since 2010. These data (Table 12) show that our incoming freshmen are well prepared for college based on their ACT score.

Table 12. History of Admissions Standards for Freshmen Admissions for Past Eight Years.

Academic year	# Students	Min ACT Composite	Average ACT Composite
2010	14	20	26
2011	41	21	27
2012	42	21	28
2013	47	22	29
2014	36	24	29
2015	51	22	28
2016	58	19	29
2017	53	22	29

Undergraduate Retention

The influx of students since 2012, necessitated finding classrooms large enough, and instituting the use of teaching assistants to help with the computer labs. As these cohorts move up through the ranks, adjustments will need to be made to accommodate the increased numbers. With active student professional organizations and activities, our students and faculty maintain camaraderie that would be difficult in larger programs. Students are encouraged to join ASABE, IBE, or ASHRAE as part of their membership in the University of Kentucky BAE Student Branch.

A key element in our undergraduate retention strategy prior to the FYE program has been to ensure that most students are involved in a BAE course every semester of their first two critical years. This was implemented around 2000, and was done as a means of addressing the relatively remote location of the department compared to the venue for most engineering courses. As previously discussed, we now see students for the first time the Fall semester of their sophomore year. Students are encouraged to form cohorts, and the requirement for them to attend a BAE class each semester of the first two years provides opportunity for faculty to build these cohorts, encourages participation in student branch and other activities, and enables the students to become acquainted with other BAE faculty. We judge this approach to be critical to retention and to an enhanced undergraduate engineering experience.

Approximately 14.4 students have graduated each year from the BAE program during the evaluation period (Table 13). The average number of students enrolled during that time was 66.6 students, or 16.6 students per class. The average graduation rate was 72% of the average number of freshmen enrolled (20 students/year) and was approximately 86.7% of the average enrollment per class (16.6 students). Students transferring into the BAE program from other institutions, as well as other programs in the College of Engineering, tended to offset the attrition of students registering as freshmen.

Table 13. Undergraduate enrollment and BS degrees awarded since the 2012 academic year.

	2012	2013	2014	2015	2016	2017
Undergraduate students enrolled	108	122	144	168	203	195
BS degrees awarded	8	11	22	27	30	

The BAE Department has an excellent record of placing its graduates in industry. For example, recent graduates specializing in the Machine Systems Automation area found employment with John Deere Company, CNH America LLC, LinkBelt, Altech Industries, Cummins, MAC engineering, and Toyota Motor Manufacturing. Similarly students from the Controlled Environment area have been employed by Big Ass Solutions, and several local engineering/HVAC firms. Students specializing in Food and Bioprocess Engineering are

employed with Haskell Construction, Keurig Green Mountain, Algood Food Co., and. Graduates who specialized in the Bio-Environmental option of our program are employed in a variety of consulting firms in the Central Kentucky region including Fuller, Mossberger, Scott and May (FMSM), Tetra Tech EM Inc., CDP Engineers, GRW Engineers, and Mac Tech. Our bioenvironmental alumni have also found employment at the Kentucky Division of Water, Army Corps of Engineers, Kentucky Division of Air Quality, and Kentucky American Water. Many BAE graduates pursue graduate degrees (typically either in Biosystems Engineering or in Biomedical Engineering), obtain an MBA, or attend medical school. We have alumni in graduate programs here at UK, but also at the University of Michigan, University of Louisville, and University of Wisconsin. We have alumni in medical school at the University of Kentucky, University of Louisville, and the University of Cincinnati. Our graduates who also obtained an MBA are working at places like Syngenta Ag, Macy's, UPS, and CTI Clinical Trial and Consulting Services. Recently, we have been placing more graduates at technology companies (Epic, Madison, WI) and utility companies (Schneider Electric, Pleasanton, CA and Owen Electric, Dry Ridge, KY).

Undergraduate recruiting is going well. The department has worked with the Career Development offices in both Colleges to develop more internships to accommodate our growing student population. Students acquiring internships and jobs upon graduation will be critical to our department's continued enrollment growth. The College of Engineering is looking at methods to increase student numbers by offering new programs. These potentially include an undergraduate Biomedical Engineering degree, completer degrees for students who left without a degree, on-line graduate degrees, and other options. These could have an impact on the department and we need to stay engaged with the process.

Research

Faculty Specializations

In general, all research efforts can be rather loosely grouped into one of four major thrusts; Controlled Environment Systems, Machine Systems, Food and Bioprocess Engineering, or Bioenvironmental Engineering. While these groupings, suggest segmentation of the overall research program into four major areas, expertise of individual faculty members often straddles two or more groupings. The distribution of faculty was provided in an earlier section.

Research Metrics

The traditional metrics for research productivity has been the number of referred journal publications and grant expenditures summarized in Table 14. The number of full time faculty varied between 14 and 17 until 2016. In fiscal year 2017 (July 1, 2016 – June 30, 2017), the number of full time faculty was 18, with two faculty joining mid-year. The data in Table 14 is primarily from the statistical reports provided by the College. The data for fiscal year 2017 are preliminary as the college reports are in production at the time of this report. The publication record prior to fiscal year 2017 was poor. However, new faculty hired over the previous five years and a focus by Dr. Nokes has resulted in significantly increased refereed journal

publications. We averaged approximately 1 article per full time faculty member in 2016. In calendar year 2017, it increased to over 2 articles per full time faculty member.

Table 14. Research productivity metrics for BAE (data taken from departmental statistical reports)

	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Full time faculty	16	16	16	17	14	19
Research FTE	7.4	6.9	6.9	6.9	6.2	7.5
Books and book chapters	3	3	3	1	1	4
Refereed journal articles	17	14	17	19	13	36
Publications per full time faculty	0.9	1.1	0.9	0.9	1.1	2.1
Publications per research FTE	2.2	2.3	2.3	2.5	2.3	5.4
Grant expenditures, $	2,435,819	2,889,759	2,567,524	2,230,119	2,061,039	1,339,698

Grant expenditures are an important metric for multiple reasons. It is an indication of department success and is required to fund graduate students. The department averaged over 2 million dollars per year in grant expenditures from 2012-2016. The grant expenditures are lower in fiscal year 2017, but it is expected to increase as junior faculty become more successful in obtaining grant funds. Grant salary savings are a significant source of operating funds shown in Table 4.

Graduate Program

Graduate student enrollment and degrees award at the MS and PhD level are summarized in Table 15. The number of MS students enrolled in the program has drifted lower. This is due to decreased grant funding and faculty retirements, and the time required for assistant professors to get their programs started. The number of PhD students who have completed a degree is low compared to most institutions, but is in line with historical trends.

Table 15. Graduate student enrollment (MS and PhD) and degrees awarded since the 2012 academic year.

	2012	2013	2014	2015	2016	2017
MS students enrolled	22	22	22	22	14	13
MS degrees awarded	7	8	16	9	5	9
PhD students enrolled	9	9	5	10	10	10

PhD degrees awarded	4	3	1	1	2	0

The time to completion for the MS and PhD graduates is shown in Figure 2. On average, MS students required between 2.1 and 3.0 years to complete their degree. For PhD students, the average time to completion was between 4.0 and 4.4 years. Some of the data contains outliers that increased the amount of time required to graduate. Faculty will hire graduate students as full-time staff (Engineer Associates) that will result in longer times to completion. A total of 11 degrees during this time frame were granted to full time staff. Graduate students who do not have an engineering undergraduate degree are required to take up to 48 credits of additional coursework that would allow them to sit for the FE exam in Kentucky.

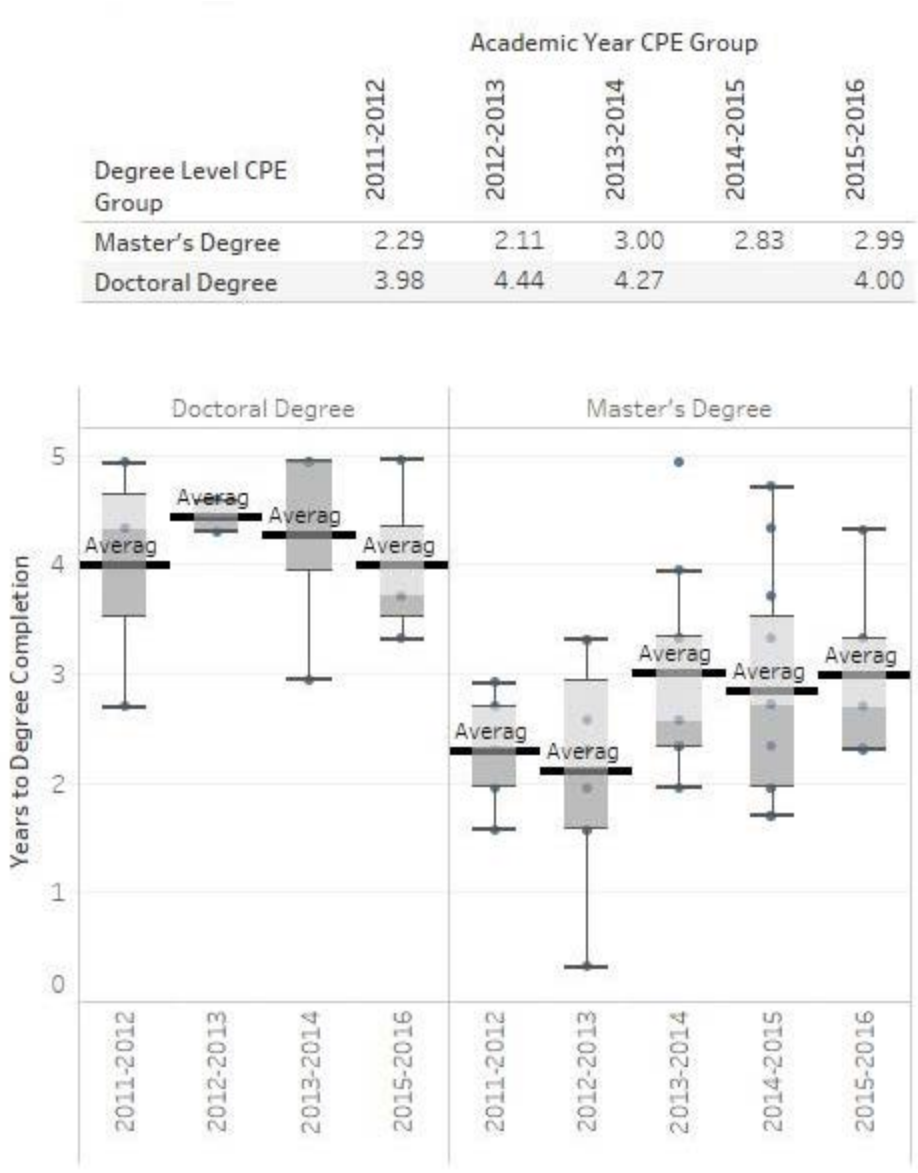


Figure 2. Average time to degree in years for MS and PhD.

A number of technical electives for Biosystems Engineering undergraduates and graduate courses are available (Appendix B – Undergraduate Elective Courses and Graduate Courses). The technical elective courses are sufficient for undergraduate students. Appendix B only summarizes the courses that have been offered by BAE faculty since Fall 2015. The Graduate School at UK requires MS students to take 12 credits of 600 level or higher courses within the department. Most specializations have handled this by cross listing classes with other departments. However, it can be difficult for MS students to meet the requirement of 12 credits of 600 level or higher courses with a BAE prefix. Numerous students will take BAE 750 (Special Topics in BAE) to meet the 600 level requirement.

PhD students have typically been expected to take 60 credits beyond the BS degree, although the Graduate School only requires 36 hours beyond the BS (with 18 counted from an MS). A balance needs to found between coursework and other factors that influence the employment prospects of our PhD graduates.

Extension Programming

The BAE Extension program provides a unique service by applying sound engineering principles and practices to the entire Kentucky Cooperative Extension Service and their clientele as well as taking an active role in providing practical uses for basic engineering research results through applied research. BAE faculty cooperate with a number of departments in CAFE. These include, Agricultural Economics, Animal and Food Science, Forestry, Entomology, Family and Consumer Sciences, Plant Pathology, and Plant and Soil Science faculties and county Extension personnel in educational activities and applied research related to engineering aspects of crop production, livestock production systems, energy conservation and environmental stewardship. The BAE Extension focus areas include agricultural weather, energy issues, farm safety, grain storage systems, hay storage, irrigation systems, livestock systems, precision agriculture, residential housing, tobacco equipment and facilities and water quality. In addition to Extension publications, the BAE Extension program makes use of the Web as a distribution tool. The web distribution needs further improvement and up to date information provided to clientele. The extension focus can be broken down into the following broad categories:

Educational Programs in Stored Grain Management - Kentucky's grain farmers produced over 281 million bushels of corn, grain sorghum, soybean, wheat and barley in 2016, which is conservatively valued over $2.6 billion. Educational programs have focused on sound management practices to preserve the quality and value of grains held in storage and have been presented to farmers, grain buyers, mill managers, elevator operators, bankers and extension educators. One impetus for county meetings was to assist farmers with decisions on upgrading grain handling equipment or increasing drying or storage capacity while decreasing energy consumption. Contact: Sam McNeill.

Energy Efficiency and Renewable Energy Audits – Since 2008, a major emphasis has been working with Kentucky producers and rural businesses to compete for federal and state grants related to renewable energy and energy efficiency projects. Managed by the Kentucky Ag Development Fund (KADF) and USDA-Rural Development (RD) offices, these programs

provide cost share for up to 50% of the project cost. Technical assistance is required to complete an energy assessment for each application. Where energy savings were found, assistance was provided to prepare applications made to the KADF program and/or the Rural Energy for America Program (REAP). Over 400 energy assessments were conducted by the UK-BAE team from 2008 to July 2017 with total project costs of $27.258 M, grant funding of $6.361 M to Kentucky operations, and a total energy savings of $2.653 M per year for all projects (average of $6,632 per project per year). Contact: Sam McNeill/Doug Overhults

Farm Safety - The department continues to have a program in the area of farm safety that includes educational programs or materials on tractor & machinery safety, rollover protection structure (ROPS) promotion, grain handling and storage safety, and ATV safety. Contact: Mark Purschwitz.

Irrigation Systems – Interest in irrigation for specialty crops and traditional crops has increased. Irrigation for specialty crops has primarily focused on drip irrigation systems. To meet this demand, the department provided an irrigation program that focuses on teaching the agents basics of drip irrigation systems by having them participate in hands-on training and in demonstration field days in addition to providing basic design assistance. However, this position is now vacant due to a retirement. Large-scale irrigation of grain crops has increased significantly in the past five years and is a gap in the department expertise. Connecting with the UK Forage and Grain Center for Excellence would be a likely conduit to support irrigation work. Contact: Vacant

Kentucky Agriculture Water Quality Best Management Practice Development, Demonstration, and Education Program – The Kentucky Agricultural Water Quality Act (KAWQA) of 1994 was a significant step towards developing a comprehensive suite of water quality Best Management Practices (BMPs) specific to Kentucky that can be used by agricultural producers. However, adoption and implementation of KAWQA BMPs has not been seen as a priority for many Kentucky producers. Research conducted nation-wide has identified many possible reasons for the lack of adoption of water quality related conservation practices, including but not limited to economics, lack of information, and individual producer attitudes. There is an abundance of literature documenting the recent surge in BMP research and development; however, many producers still view water quality and nutrient management BMPs as unimportant and as barriers to farm profits. The Kentucky agricultural industry needs a holistic approach involving education, demonstration, and producer involvement to make the connection between the benefits of BMPs required by the KAWQA and the practices needed to competitively produce livestock. The majority of agriculture producers are experiential learners. If producers are provided hands-on learning opportunities and are convinced that tangible benefits are achievable and affordable, they will be more likely to make the commitment needed to adapt their management strategies and fully implement BMPs. BMP demonstration sites have been established throughout the state in partnership with multiple agricultural operations and are routinely leveraged for extension and outreach events focusing on topics related to water quality/quantity, operational efficiency, and environmental protection. Regular presentations of program material also occur through the Master Cattleman Program, county Cooperative

Extension programs, and various invited speaking engagements. Multiple Cooperative Extension publications have been developed through this program to serve as resources for agricultural producers and resource professionals statewide. This program has been funded through the Kentucky Division of Water (§ 319 of the Clean Water Act pass through dollars) since 2012. Contact: Steve Higgins.

Livestock Systems - The department continues to have an Extension program that focuses on livestock production. This is evident in the two assistant extension professors hired to work in livestock systems. Work covered includes confined and pasture based systems. Within the confined area, livestock facility ventilation, layout and design are covered. In addition, the department has a long-standing effort in pasture based livestock production. These topics include stream riparian zone management for grazing systems, alternate water supply, winter paddock management, handling facilities, use of unmanned aerial vehicles to determine livestock health, and geotextile gravel pads for high traffic areas and stream crossings. There is an increasing emphasis placed on the design of manure handling and treatment systems which has resulted in an increased level of support provided by the department. Contact: Morgan Hayes/Josh Jackson/Doug Overhults/Joseph Taraba

Precision Agriculture - One of the traditional program areas supported by the department is precision agriculture. Among the topics covered in this program have been yield monitoring and sprayer application technologies. This work has included conducting on-farm research, drawing meaningful conclusions from the results and disseminating this information to other producers. Another topic of interest by producer has been variable-rate technology (seed, fertilizer and chemicals) to optimize grain production while considering the economics of variable-rate practices. Contact: Tim Stombaugh

Residential Housing/Residential Energy/Radon Education - The department had a significant effort in residential energy efficiency and indoor air quality issues. The energy conservation work is focused on proper insulation levels and techniques and proper sizing of HVAC systems. The indoor air quality work focuses primarily on mold and humidity control. Funding changes from the State and retirements has likely ended this area in 2017. Contact: Vacant

Tobacco Equipment and Facilities - While a traditional program in our department, work on tobacco handling and curing systems is undergoing review. The question the department must now answer is the future needs for this program given the significant changes in tobacco production industry and the lack of personnel. Contact: Vacant

Extension Metrics

Departmental extension productivity, as measured by the variables reported through the Kentucky Extension Reporting System (KERS), is presented in table 16. The faculty contacts with Kentucky citizens and the number of success stories have both increased in 2017 as compared to the prior 4 years.

Table 16. Departmental Extension Productivity 5 year trend.

KERS Contacts Five-Year Trend

	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
African Am.	362	100	676	754	1159
Asian Am.	45	8	4	16	227
Hispanic	27	35	28	15	438
Native Am.	0	0	0	0	0
Other	20	0	85	0	36
Total Contacts	5,128	2,211	4,909	4,950	15,014

KERS Number of Success Stories Five-Year Trend

2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
11	2	6	10	16

2015-2016 Numbered Fact Sheets/Faculty Ratio

	Total FT Faculty	FTE Ext. Faculty
	14	2.91
Total Fact Sheets	4	4
Average per faculty	0.29	1.37

BAE Faculty Achievements and Awards

Akinbode Adedeji Carnegie Fellow, 2016; Outstanding Associate Editor for Trans of ASABE, 2016.

Carmen Agouridis ASABE Educational Aids Blue Ribbon Award, 2014 and 2017; UK Kentucky Women in Executive Leadership Development, 2016; ASABE Standards Award, 2016; UK College of Education, Teacher Who Made a Difference, 2016; UK Gamma Sigma Delta Master Teacher Award, 2015; ASABE A.W. Farrall Young Educator Award, 2014;

ASABE Outstanding Reviewer, 2012; US Department of Interior's Secretary's Partner's in Conservation Award to ARRI Core and Academic Teams, 2011 and 2012; Association of Public Land-Grant Universities Engagement Award, 2011.

Donald Colliver Outstanding Industrial Assessment Center of the year from DOE, 2016.

Czar Crofcheck Henry Mason Lutes Award for Outstanding Engineering Education, 2017; CAFE Instruction Empowerment Award, 2016; UK College of Engineering's Dean's Award for Excellence in Service, 2014.

Joe Dvorak Professional Engineer Licensure, 2015; ASABE Superior Paper Award, 2016.

Samuel McNeill Outstanding Extension Specialist from KACAA, 2014; ASABE Educational Aids Blue Ribbon Award for Extension Methods, 2015 and 2017.

Alicia Modenbach Professional Engineer Licensure, 2017; UK Faculty Fellows Cohort 7, 2017; ASABE Gale A. Holloway Professional Development Award, 2016.

Sue Nokes ASABE Presidential Commendation for Service to the Society as Treasurer and Chair of Initiative Fund Selection Committee, 2017; UK CAFE Research Empowerment Awards, 2016; ASABE Fellow, 2016; Distinguished Alumni Award, FABE, The Ohio State University, 2016; UK Provost's Outstanding Teaching Award, 2012.

Doug Overhults UK Gamma Sigma Delta Distinguished Service Award, 2017; Kentucky Poultry Federation hall of Fame, 2017; Rural Builder Hall of Fame, 2015; Rural Electricity Resource Council Distinguished Service Award, 2013.

Mark Purschwitz ASABE SMV Technologies Ergonomics Safety and Health Award, 2012.

Michael Sama ASABE Superior Paper Awards (3), ASABE New Faces of Engineering, ASABE Sunkist Young Designer, 2015.

Joseph Taraba ASABE Superior Paper Award, 2013.

Larry Wells ASABE Fellow, 2014.

Appendix A – Undergraduate Courses

Required and core undergraduate courses, instructors and offerings since Fall 2015.

Course	Name (credits)	Instructor	Offered
BAE 200	Principles of Biosystems Engineering (3)	Modenbach	F 17
BAE 202	Statistical Inferences for Biosystems Engineering (3)	Crofcheck	S 16 / S 17 / S 18
BAE 301	Economic Analysis for Biosystems (2) (offered as 201 in Fall 15 and 16)	Montross	F 15/ F 16
BAE 305	DC Circuits and Microelectronics (3)	Dvorak	S 16 / S 17 / S 18
BAE 400	Senior Seminar (1)	Adedeji	F 15 / F 16 / F 17
BAE 402	Biosystems Engineering Design I (2)	Nokes/Peterson	F 15 / F 16 / F 17
BAE 403	Biosystems Engineering Design II (2)	Nokes/Peterson	S 16 / S 17 / S 18
BAE 417	Design of Machine Systems (3)	Stombaugh	F 15 / F 16 / F 17
BAE 427	Structures and Environment Engineering (3)	Hayes	S 16 / S 17 / S 18
BAE 437	Land and Water Resources Engineering (3)	Ford	S 16 / S 17 / S 18
BAE 447	Bioprocess Engineering Fundamentals (3)	Nokes	F 15 / F 16 / F 17

Appendix B – Undergraduate Elective Courses and Graduate Courses

BAE technical elective and graduate courses offered since Fall 2015 taught by BAE faculty.

Course	Name (credits)	Instructor	Offered
BAE 435G	Waste Management for Biosystems (3)	Taraba	F 15 / F 16 / F 17
BAE 502	Modeling of Biological Systems (3)	Ford	S 16 / S 17 / S 18
BAE 504	Biofuels Production (3)	Shi	F 15 / F 16 / F 17
BAE 514	Component Design (3)	Sama	S 18
BAE 515	Fluid Power Systems (3)	Dvorak	F 15 / F 16 / F 17
BAE 532	Intro to Stream Restoration (3)	Agouridis	F 15 / S 16 / S 17 / S 18
BAE 535	Env Cntrl Sys Des & Reclam (3)	Agouridis / Warner	S 17
BAE 536	Fluvial Hydraulics (3)	Edwards	F 15 / F 16 / F 17
BAE 549	Bio Process Engineering (3)	Adedeji	F 15 / F 16 / F 17
BAE 580	Heating, Ventilating & Air-Conditioning (3)	Colliver	S 16 / S 17 / F 17
BAE 599	Energy Assessment (3)	Colliver	S 17 / F 17
BAE 599	Control of Off-Road Vehicles (3)	Sama	S 17
BAE 625	Top Adv Environmental Control/Anal	Colliver	S 17
BAE 658	Instrumentation for Engineering Research (3)	Sama	F 15 / F 16 / F 17
BAE 662	Stochastic Hydrology (3)	Edwards	S 16 / S 17
BAE 775	Professional Practices Seminar (2)	Edwards / Montross	F / S of each year

Appendix C - BAE Grants FY 2012-2017

University of Kentucky Sponsored Project Award Funding

Primary and Collaborative Project Totals (Details)

College of Agriculture, Food and Environment, Department: **Biosystems & Ag Eng**

Fiscal Year Ending FY 2012

Project PI	Investigator List	Project Title	Sponsor Name	Primary Total	Collaboration	*Total*
Andrews, Rodney	Andrews, Rodney/Crofcheck, Czarena/Montross, Michael	Demonstration of an Algae-based System for CO2 Mitigation from Coal-fired Power Plants	KY Energy and Environment Cabinet		$761,552	**$761,552**
Coolong, Timothy	Coolong, Timothy/Bessin, Ricardo/Seebold, Kenneth/Wilhoit, John/Woods, Timothy/Wright, Shawn/Yeargan, Ricky	Specialty Crop: The Vegetable Academy: A Short Course to Advance Vegetable Production in Kentucky	KY Department of Agriculture		$24,469	**$24,469**
Fehr, Robert	Fehr, Robert	A Cooperative Extension Program for Kentucky's Building Systems Energy Needs 2011-2012	KY Energy and Environment Cabinet	$110,000		**$110,000**
		FY12 CHFS/DPH UK Extension Radon Activities	KY Cabinet for Health and Family Services	$23,515		**$23,515**
		Kentucky Cooperative Extension Service Energy Efficiency Awareness and Action	KY Energy and Environment Cabinet	$200,704		**$200,704**
HANCOCK, JOHN	Hancock, John/Purschwitz, Mark	Kentucky AgrAbility	National Institute of Food and Agriculture		$162,000	**$162,000**
HOLLOWAY, LAWRENCE	Holloway, Lawrence/Colliver, Donald/Henninger, John/Sekulic, Dusan	Kentucky Industrial Assessment Center (KIAC): Developing the Next Generation Energy Assessment Engineering Workforce	Department of Energy		$120,000	**$120,000**
HOUTZ, ROBERT	Houtz, Robert/Archbold, Douglas/Bruening, William/Coolong, Timothy/DeBolt, Seth/Dillon, Carl/Grabau, Larry/Halich, Gregory/Hu,..	New Crop Opportunities, Phase X	Cooperative State Research Education and Extension		$8,413	**$8,413**
Husband, Andrea	Husband, Andrea/Dwyer, Roberta/Newman, Melissa/Priddy, Kenny/Yeargan, Ricky	The EDEN Strengthening Community Agrosecurity Planning (S-CAP) Train-the-Trainer Project: Phase 2	Purdue University		$51,500	**$51,500**
McKnight, Robert	McKnight, Robert/Anyaegbunam, Chike/Cole, Henry/Hains, Bryan/Mazur, Joan/Myers, Melvin/Purschwitz, Mark/Reed, Deborah/..	Southeast Center for Agricultural Health and Injury Prevention	National Institute of Occupational Safety and Health		$997,700	**$997,700**
	McKnight, Robert/Cole, Henry/Purschwitz, Mark	Agricultural Safety and Health Training for Public Health Graduate Students	National Institute of Occupational Safety and Health		$58,672	**$58,672**
McNeill, S	McNeill, S	Nigeria:Commodity Storage-Technical Assistance	Foreign Agricultural Service	$46,651		**$46,651**
	McNeill, S/Montross, Michael/Overhults, Douglas/Shearer, Scott	Energy Audits for Grain and Poultry Producers in Kentucky	Rural Development	$12,650		**$12,650**
Montross, Michael	Montross, Michael	Increasing Bale Density by Crushing Nodes Using Crop Processing Rollers	Case New Holland America LLC	$132,602		**$132,602**
Nokes, Sue	Nokes, Sue/Crofcheck, Czarena/DeBolt, Seth/Halich, Gregory/Knutson, Barbara/Lee, Chad/Lynn, Bert/Montross, Michael/..	On-Farm Biomass Processing: Towards an Integrated High Solids Transporting/Storing/Processing System	National Institute of Food and Agriculture	$1,000,000		**$1,000,000**
ORMSBEE, LINDELL	Ormsbee, Lindell/Agouridis, Carmen/Atwood, David/Beck, Ennis/Currens, James/Wendroth, Ole	State Water Institute Fiscal Year 2011-2012	US Geological Survey		$92,335	**$92,335**
RANKIN, STEPHEN	Rankin, Stephen/Knutson, Barbara/Nokes, Sue	KSEF Emerging Ideas: Interfacial Engineering of Biomass Saccharification by T. reesei enzymes	KY Science and Technology Co Inc		$48,594	**$48,594**
Smith, Samuel	Smith, Samuel/Montross, Michael	Farm Scale Biomass Production for Electricity Gerneration and Community Development	KY Forage and Grasslands Council		$259,903	**$259,903**
Stombaugh, Timothy	Stombaugh, Timothy	Test Plan for Next Gen Combine Grain Sampling System and Moisture Sensor	Deere and Company	$1,915		**$1,915**
	Stombaugh, Timothy/Workman, Stephen	Food and Energy Production: Internationalized Agricultural and Engineering Programs	Department of Education	$134,148		**$134,148**
Taraba, Joseph	Taraba, Joseph/Bewley, Jeffrey/Day, George/Missun, Traci	Compost bedded pack barn housing system for dairy manure storage/treatment	Natural Resources Conservation Service	$132,941		**$132,941**
WARNER, RICHARD	Warner, Richard/Agouridis, Carmen/Barton, Christopher/Unrine, Jason	Appalachian Research Initiative for Environmental Science (ARIES)	Virginia Polytechnic Institute and State University	$408,533		**$408,533**
Total				***$2,203,659***	***$2,585,138***	**$4,788,797**

Note: Primary total includes all dollars for projects assigned to that department/unit--the prime department of the contact PI or the unit primarily responsible for the proposal. Collaborations are based on co-I involvement on projects outside of the department. Collaboration dollars (value) equals the total award for that project during the fiscal year. It DOES NOT represent the enrichment split or the faculty percent effort on the grant project.

*Source: OSPA Database, updated: 11/30/2017 **(FY18 includes July 1, 2017 through November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Primary and Collaborative Project Totals (Details)

College of Agriculture, Food and Environment, Department: **Biosystems & Ag Eng**

Fiscal Year Ending FY 2013

Project PI	Investigator List	Project Title	Sponsor Name	Primary Total	Collaboration	*Total*
Agouridis, Carmen	AGOURIDIS, CARMEN/BARTON, CHRISTOPHER/WARNER, RICHARD	Stream Restoration in Guy Cove II, Laurel Fork Fees in Lieu of Stream Restoration Project	KY Department of Fish and Wildlife	$4,949		**$4,949**
Andrews, Rodney	Andrews, Rodney/Crocker, Mark/Crofcheck, Czarena	Demonstration of an Algae-based System for CO2 Mitigation from Coal-fired Power Plants	KY Energy and Environment Cabinet		$531,409	**$531,409**
Bewley, Jeffrey	Bewley, Jeffrey/Arnold, Laura/Day, George/Jacobsen, Krista/Taraba, Joseph	A Preliminary Assessment of the Potential for Compost Bedded Pack Barns in Sustainable Organic Dairy Farming Systems	Organic Valley Family of Farms		$4,909	**$4,909**
	Bewley, Jeffrey/Arnold, Laura/Eckelkamp, Elizabeth/Taraba, Joseph	Clinical Mastitis Incidence in Compost Bedded Pack Barns as Compared to Freestall Barns	University of Georgia		$13,750	**$13,750**
	Bewley, Jeffrey/Taraba, Joseph	Compost Bedded Pack Dairy Barn Management	KY Governor's Office of Agricultural Policy		$53,875	**$53,875**
Crofcheck, Czarena	Crofcheck, Czarena	Low Cost Biomass Saccharification Process for Producing Biofuels	Eastern KY University	$28,454		**$28,454**
D'ANGELO, ELISA	D'Angelo, Elisa/Agouridis, Carmen/Hower, James/McNear, David/Unrine, Jason/Warner, Richard	Remediation of coal slurry impoundment liquids using a multi-stage constructed treatment wetland system	KY Energy and Environment Cabinet		$61,355	**$61,355**
Fehr, Robert	Fehr, Robert	A Cooperative Extension Program for Kentucky's Energy Efficiency Education Needs 2012-2013	KY Energy and Environment Cabinet	$113,000		**$113,000**
FOX, JAMES	Fox, James/Agouridis, Carmen/Brion, Gail	KSEF RDE: DIN Waste Management Tool For Estimating Nitrogen Removal By Sediments	KY Science and Technology Co Inc		$49,951	**$49,951**
Fryar, Alan	Fryar, Alan/Agouridis, Carmen/Hanley, Carol/Reed, Michael/Tanaka, Keiko	BOOST H2O (Helping Hydrologic Outreach) in Indonesia and Turkey	Department of State		$197,299	**$197,299**
HANCOCK, JOHN	Hancock, John/Purschwitz, Mark	Kentucky AgrAbility	National Institute of Food and Agriculture		$162,000	**$162,000**
HANLEY, CAROL	Hanley, Carol/Agouridis, Carmen	Engaging Partners in a Comprehensive Watershed Project, Urban Waters Small Grant	Environmental Protection Agency		$59,934	**$59,934**
Higgins, Stephen	Higgins, Stephen	Conservation Practice Code 590 Nutrient Management Training	Natural Resources Conservation Service	$27,500		**$27,500**
	Higgins, Stephen/Gumbert, Amanda	Managing Mud, Manure, and Runoff: Kentucky Livestock BMP Demonstration and Training Project	KY Energy and Environment Cabinet	$500,000		**$500,000**
HOLLOWAY, LAWRENCE	Holloway, Lawrence/Colliver, Donald/Henninger, John/Sekulic, Dusan	Kentucky Industrial Assessment Center (KIAC): Developing the Next Generation Energy Assessment Engineering Workforce	Department of Energy		$309,202	**$309,202**
Luhan, Gregory	Luhan, Gregory/Colliver, Donald/Medina, Shiela	Southern Tier Housing Corporation TVA Mitigation Project	Southern Tier Housing Corporation		$336,671	**$336,671**
Mannino, David	Mannino, David/McKnight, Robert/Anyaegbunam, Chike/Chesnut, Lorie/Hains, Bryan/Isaacs, Steven/Mazur, Joan/Purschwitz, Mark/R..	Southeast Center for Agricultural Health and Injury Prevention: Admin Core	National Institute of Occupational Safety and Health		$1,269,925	**$1,269,925**
McNeill, S	McNeill, S/Halich, Gregory/Lee, Chad/Meyer, Alphonse	Developing an Organic Corn Enterprise in Kentucky	University of Georgia	$10,000		**$10,000**
	McNeill, S/Montross, Michael/Overhults, Douglas/Shearer, Scott	Energy Audits for Grain and Poultry Producers in Kentucky	Rural Development	$14,900		**$14,900**
Montross, Michael	Montross, Michael	Evaluation of pressure in crop processing systems	Case New Holland America LLC	$41,000		**$41,000**
Nokes, Sue	Nokes, Sue/Crofcheck, Czarena/DeBolt, Seth/Halich, Gregory/Knutson, Barbara/Lee, Chad/Lynn, Bert/Montross, Michael/..	On-Farm Biomass Processing: Towards an Integrated High Solids Transporting/Storing/Processing System	National Institute of Food and Agriculture	$5,932,786		**$5,932,786**
Sanderson, Wayne	Sanderson, Wayne/Browning, Steven/Hahn, Ellen/Honaker, Rick/Lineberry, Gene/McKnight, Robert/Purschwitz, Mark/Reed, De..	Central Appalachian Regional Education Research Center	National Institute of Occupational Safety and Health		$605,689	**$605,689**
Smith, Samuel	Smith, Samuel/Montross, Michael	Farm Scale Biomass Production for Electricity Gerneration and Community Development	KY Forage and Grasslands Council		$20,000	**$20,000**
WARNER, RICHARD	Warner, Richard/Agouridis, Carmen/Barton, Christopher/Unrine, Jason	Appalachian Research Initiative for Environmental Science (ARIES)	Virginia Polytechnic Institute and State University	$287,350		**$287,350**
WELLS, LARRY	WELLS, LARRY	Implementation and Assessment of Mechanical Burley Tobacco Harvesting Systems in France during 2012	Association Nationale Interprofessionnelle Et Technique Du ..	$15,092		**$15,092**
		Support of the French tobacco sector in mechanization of Burley tobacco	Association Nationale Interprofessionnelle Et Technique Du ..	$15,000		**$15,000**
Total				***$6,990,031***	***$3,675,969***	**$10,666,000**

Note: Primary total includes all dollars for projects assigned to that department/unit--the prime department of the contact PI or the unit primarily responsible for the proposal. Collaborations are based on co-I involvement on projects outside of the department. Collaboration dollars (value) equals the total award for that project during the fiscal year. It DOES NOT represent the enrichment split or the faculty percent effort on the grant project.

*Source: OSPA Database, updated: 11/30/2017 (**FY18 includes July 1, 2017 through November 30, 2017**)*
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Primary and Collaborative Project Totals (Details)

College of Agriculture, Food and Environment, Department: **Biosystems & Ag Eng**

Fiscal Year Ending FY 2014

Project PI	Investigator List	Project Title	Sponsor Name	Primary Total	Collaboration	*Total*
Andrews, Rodney	Andrews, Rodney/Beck, Matthew/Bhattacharyya, Dibakar/Cheng, Yang-Tse/Crofcheck, Czarena/DeBolt, Seth/Odom, Susan/Payne, C..	NSF EPSCoR: Powering the Kentucky Bioeconomy for a Sustainable Future	National Science Foundation		$4,000,000	**$4,000,000**
	Andrews, Rodney/Crocker, Mark/Crofcheck, Czarena	Demonstration of an Algae-based System for CO2 Mitigation from Coal-fired Power Plants	KY Energy and Environment Cabinet		$155,146	**$155,146**
Crofcheck, Czarena	Crofcheck, Czarena	Enhancement of Collaboration at the Annual Meeting of Institute of Biological Engineering (IBE)	Oak Ridge Associated Universities	$3,000		**$3,000**
	Crofcheck, Czarena/Liu, Kunlei	Screening And Evaluation Of Oilfield Sewage -proof Microalgae	Sinopec Petroleum Engineering Corporation	$50,000		**$50,000**
Fehr, Robert	Fehr, Robert	A Cooperative Extension Program for Kentucky#s Energy Efficiency Education Needs 2013-2014	KY Energy and Environment Cabinet	$100,000		**$100,000**
HOLLOWAY, LAWRENCE	Holloway, Lawrence/Cheng, Yang-Tse/Colliver, Donald/Liao, Yuan/Lipka, Steve/Parker, Johne/Singh, Vijay/Sottile, Joseph/Taylor..	ARRA:Power and Energy Institute at the University of Kentucky	Department of Energy		$1,537	**$1,537**
	Holloway, Lawrence/Colliver, Donald/Cramer, Aaron/Fei, Zongming/Liao, Yuan/Sottile, Joseph	FEEDER: Foundations for Engineering Education for Distributed Energy Resources	University of Central Florida		$80,959	**$80,959**
	Holloway, Lawrence/Colliver, Donald/Henninger, John/Sekulic, Dusan	Kentucky Industrial Assessment Center (KIAC): Developing the Next Generation Energy Assessment Engineering Workforce	Department of Energy		$200,000	**$200,000**
Mannino, David	Mannino, David/Anyaegbunam, Chike/Browning, Steven/Chesnut, Lorie/Clouser, Jessica/Hains, Bryan/Isaacs, Steven/Mazur, Joan/Pu..	Southeast Center for Agricultural Health and Injury Prevention	National Institute of Occupational Safety and Health		$1,266,342	**$1,266,342**
McNeill, S	McNeill, S	Alliance for Food Security Through Reduction of Postharvest Loss and Food Waste	Oklahoma State University	$27,386		**$27,386**
		Nigeria:Commodity Storage-Technical Assistance	Foreign Agricultural Service	$15,221		**$15,221**
	McNeill, S/Montross, Michael/Overhults, Douglas	Energy Audits for Grain and Poultry Producers in Kentucky	Rural Development	$3,000		**$3,000**
Purschwitz, Mark	Purschwitz, Mark	Safety in Agriculture for Youth (SAY)	Pennsylvania State University	$25,000		**$25,000**
Sanderson, Wayne	Sanderson, Wayne/Browning, Steven/Hahn, Ellen/Honaker, Rick/Purschwitz, Mark/Reed, Deborah/Sottile, Joseph/Westneat, Da..	Central Appalachian Regional Education Research Center	National Institute of Occupational Safety and Health		$570,900	**$570,900**
Stombaugh, Timothy	Stombaugh, Timothy/Dvorak, Joseph	Control and Monitoring of Sprayer Output	Case New Holland America LLC	$85,000		**$85,000**
		Phase 2: Control and Monitoring of Sprayer Output	Case New Holland America LLC	$200,000		**$200,000**
WARNER, RICHARD	WARNER, RICHARD/AGOURIDIS, CARMEN	Ensuring Restoration Success and Management Effectiveness for the Imperiled Blackside Dace at Cumberland Gap National Historical Park: Sedi..	US Geological Survey	$50,600		**$50,600**
	Warner, Richard/Agouridis, Carmen/Barton, Christopher/Unrine, Jason	Appalachian Research Initiative for Environmental Science (ARIES)	Virginia Polytechnic Institute and State University	$35,000		**$35,000**
WELLS, LARRY	WELLS, LARRY	Support of the French tobacco sector in mechanization of Burley tobacco	Association Nationale Interprofessionnelle Et Technique Du ..	($60)		**($60)**
Total				***$594,147***	***$6,274,884***	**$6,869,031**

Note: Primary total includes all dollars for projects assigned to that department/unit--the prime department of the contact PI or the unit primarily responsible for the proposal. Collaborations are based on co-I involvement on projects outside of the department. Collaboration dollars (value) equals the total award for that project during the fiscal year. It DOES NOT represent the enrichment split or the faculty percent effort on the grant project.

*Source: OSPA Database, updated: 11/30/2017 (**FY18 includes July 1, 2017 through November 30, 2017**)*
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Primary and Collaborative Project Totals (Details)

College of Agriculture, Food and Environment, Department: **Biosystems & Ag Eng**

Fiscal Year Ending FY 2015

Project PI	Investigator List	Project Title	Sponsor Name	Primary Total	Collaboration	*Total*
Adedeji, Akinbode	Adedeji, Akinbode	Application of Hyperspectral Imaging System for Detection of Adulterants in Foods	Burroughs Wellcome Fund	$6,760		**$6,760**
COLLIVER, DONALD	Colliver, Donald/Holloway, Lawrence/Henninger, John/Holloway, Lawrence/Sekulic, Dusan	Kentucky Industrial Assessment Center (KIAC): Developing the Next Generation Energy Assessment Engineering Workforce	Department of Energy		$250,000	**$250,000**
CROCKER, MARK	Crocker, Mark/Crofcheck, Czarena/Groppo, John/Wilson, Michael	Demonstration of an Algae-based System for CO2 Mitigation from Coal-fired Power Plants	Duke Energy KY Inc		$155,146	**$155,146**
		Techno-economic and Lifecycle Evaluation of Optimized Photobioreactor- and Pond-based Microalgae Systems for CO2 Mitigation - Topic 1	KY Energy and Environment Cabinet		$253,000	**$253,000**
Crofcheck, Czarena	Crofcheck, Czarena/Liu, Kunlei	Screening And Evaluation Of Oilfield Sewage -proof Microalgae	Sinopec Petroleum Engineering Corporation	($1,931)		**($1,931)**
Fehr, Robert	Fehr, Robert	CES Radon Outreach Program	KY Department for Public Health	$42,028		**$42,028**
		Energy Education Awareness and Action (E2A2)	KY Energy and Environment Cabinet	$17,500		**$17,500**
		Kentucky Cooperative Extension Education Energy Outreach Program, 2014-2015	KY Energy and Environment Cabinet	$100,000		**$100,000**
Higgins, Stephen	Higgins, Stephen/Gumbert, Amanda	Managing Mud, Manure, and Runoff: Kentucky Livestock BMP Demonstration and Training Project	KY Energy and Environment Cabinet	$18,000		**$18,000**
HOLLOWAY, LAWRENCE	Holloway, Lawrence/Colliver, Donald/Cramer, Aaron/Fei, Zongming/Liao, Yuan/Sottile, Joseph	FEEDER: Foundations for Engineering Education for Distributed Energy Resources	University of Central Florida		$122,344	**$122,344**
Lee, Brad	Lee, Brad/Edwards, Dwayne/Grove, J/Ritchey, Edwin	Phosphorus runoff potential in major row crop soils of Kentucky	Natural Resources Conservation Service		$75,000	**$75,000**
Mannino, David	Mannino, David/Chesnut, Lorie/Clouser, Jessica/Hains, Bryan/Ingram, Richard/Mazur, Joan/Purschwitz, Mark/Reed, Debora..	Southeast Center for Agricultural Health and Injury Prevention	National Institute of Occupational Safety and Health		$1,238,273	**$1,238,273**
McNeill, S	McNeill, S	Nigeria Capacity Building on Stored Commodities	Foreign Agricultural Service	$46,028		**$46,028**
	McNeill, S/Montross, Michael/Overhults, Douglas	Technical Assistance for Energy Audits and Renewable Energy Projects in Rural Kentucky	Rural Development	$67,169		**$67,169**
Montross, Michael	Montross, Michael	Methods to increase bale density	Case New Holland America LLC	$81,362		**$81,362**
	Montross, Michael/McNeill, S	Factors that Affect Packing During Storage	Ohio State University	$24,547		**$24,547**
ORMSBEE, LINDELL	Ormsbee, Lindell/Agouridis, Carmen/Barton, Christopher/Cox, John/Coyne, Mark/Fox, James/Fryar, Alan/Knott, Carrie/Pennell, Kel..	State Water Institute Fiscal Year 2011-2016	US Geological Survey		$92,335	**$92,335**
Overhults, Douglas	Overhults, Douglas	Heating Broiler Barns with a Wood Pellet Furnace	KY Energy and Environment Cabinet	$20,000		**$20,000**
Pearce, Robert	Pearce, Robert/Snell, William/Swetnam, Larry	Enhancing Burley Tobacco Production Labor Efficiency	Council for Burley Tobacco		$20,000	**$20,000**
Purschwitz, Mark	Purschwitz, Mark	Safety in Agriculture for Youth (SAY)	Pennsylvania State University	$25,000		**$25,000**
Sanderson, Wayne	Sanderson, Wayne/Anderson, Debra/Ashford, Kristin/Browning, Steven/Bunn, Terry/Hahn, Ellen/Honaker, Rick/Mannino, David/Purs..	Central Appalachian Regional Education Research Center	National Institute of Occupational Safety and Health		$990,509	**$990,509**
Taraba, Joseph	Taraba, Joseph/Coyne, Mark/Reed, Michael	Proposal to Host Borlaug Fellow from Mexico on Greenhouse Gas (GHG) Emissions from Composting	Foreign Agricultural Service	$24,764		**$24,764**
WARNER, RICHARD	WARNER, RICHARD/AGOURIDIS, CARMEN	Ensuring Restoration Success and Management Effectiveness for the Imperiled Blackside Dace at Cumberland Gap National Historical Park: Sedi..	US Geological Survey	$25,300		**$25,300**
	Warner, Richard/Agouridis, Carmen/Barton, Christopher/Unrine, Jason	Appalachian Research Initiative for Environmental Science (ARIES)	Virginia Polytechnic Institute and State University	$50,000		**$50,000**
WELLS, LARRY	WELLS, LARRY	Support of the French tobacco sector in its strip-tillage, harvesting mechanization projects, curing, and stripping of Burley tobacco	Arvalis Institut du Vegetal	$14,940		**$14,940**
Wilhoit, John	Wilhoit, John	A Cost-Effective Mechanized System to Benefit the Sustainability of Local Organic Vegetable Production	University of Georgia	$14,906		**$14,906**
Total				***$576,373***	***$3,196,607***	**$3,772,980**

Note: Primary total includes all dollars for projects assigned to that department/unit--the prime department of the contact PI or the unit primarily responsible for the proposal. Collaborations are based on co-I involvement on projects outside of the department. Collaboration dollars (value) equals the total award for that project during the fiscal year. It DOES NOT represent the enrichment split or the faculty percent effort on the grant project.

*Source: OSPA Database, updated: 11/30/2017 (**FY18 includes July 1, 2017 through November 30, 2017**)*
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Primary and Collaborative Project Totals (Details)

College of Agriculture, Food and Environment, Department: **Biosystems & Ag Eng**

Fiscal Year Ending FY 2016

Project PI	Investigator List	Project Title	Sponsor Name	Primary Total	Collaboration	*Total*
Adedeji, Akinbode	Adedeji, Akinbode/Adedokun, Sunday	Extrusion Processing for Value-Added Production of Food and Feed	National Institute of Food and Agriculture	$50,000		**$50,000**
Andrews, Rodney	Andrews, Rodney/Beck, Matthew/Bhattacharyya, Dibakar/Cheng, Yang-Tse/Crofcheck, Czarena/DeBolt, Seth/Odom, Susan/Payne, C..	NSF EPSCoR: Powering the Kentucky Bioeconomy for a Sustainable Future	National Science Foundation		$8,000,000	**$8,000,000**
COLLIVER, DONALD	Colliver, Donald/Henninger, John/Holloway, Lawrence/Sekulic, Dusan	Kentucky Industrial Assessment Center (KIAC): Developing the Next Generation Energy Assessment Engineering Workforce	Department of Energy		$300,000	**$300,000**
CROCKER, MARK	Crocker, Mark/Crofcheck, Czarena	Microalgae-based Carbon Dioxide Capture and Recycle for the Production of Fuels and Plastics	KY Energy and Environment Cabinet		$125,000	**$125,000**
	Crocker, Mark/Crofcheck, Czarena/Wilson, Michael	A microalgae-based platform for the beneficial reuse of CO2 emissions from power plants	Department of Energy		$505,693	**$505,693**
Fehr, Robert	Fehr, Robert	Kentucky Energy Education and Outreach Project	KY Energy and Environment Cabinet	$100,000		**$100,000**
		Radon Education Training	KY Department for Public Health	$12,720		**$12,720**
Higgins, Stephen	Higgins, Stephen	Pollinator Habitat Installations	Natural Resources Conservation Service	$2,500		**$2,500**
HOLLOWAY, LAWRENCE	Holloway, Lawrence/Colliver, Donald/Cramer, Aaron/Fei, Zongming/Liao, Yuan/Sottile, Joseph	FEEDER: Foundations for Engineering Education for Distributed Energy Resources	University of Central Florida		$162,361	**$162,361**
Mannino, David	Mannino, David/Clouser, Jessica/Ingram, Richard/Mazur, Joan/Purschwitz, Mark/Reed, Deborah/Sanderson, Wayne/Swan, G..	Southeast Center for Agricultural Health and Injury Prevention: Admin Core	National Institute of Occupational Safety and Health		$1,217,411	**$1,217,411**
McNeill, S	McNeill, S	Alliance for Food Security Through Reduction of Postharvest Loss and Food Waste	Oklahoma State University	$5,960		**$5,960**
		Nigeria Capacity Building on Stored Commodities	Foreign Agricultural Service	$47,714		**$47,714**
		Reducing Aflatoxin Contamination of Corn in On-Farm Bin Drying and Storage Systems	University of Arkansas	$5,010		**$5,010**
Montross, Michael	Montross, Michael	Fellowship for Josh Jackson: Forage and Resource Management Tool for Beef Producers Implementing Rotational Grazing	National Institute of Food and Agriculture	$150,000		**$150,000**
	Montross, Michael/Dvorak, Joseph/Sama, Michael	Evaluation of crop logistics	Case New Holland America LLC	$20,000		**$20,000**
Nokes, Sue	Nokes, Sue/Crofcheck, Czarena/DeBolt, Seth/Halich, Gregory/Knutson, Barbara/Lee, Chad/Lynn, Bert/Montross, Michael/..	On-Farm Biomass Processing: Towards an Integrated High Solids Transporting/Storing/Processing System	National Institute of Food and Agriculture	$13,227		**$13,227**
ORMSBEE, LINDELL	Ormsbee, Lindell/Agouridis, Carmen/Edwards, Dwayne/Fryar, Alan/Lee, Brad/Price, Steven/Wang, Yitin/Wei, Yinan	104B State Water Resources Research Institute Program 2016 - 2021	US Geological Survey		$92,335	**$92,335**
Pearce, Robert	Pearce, Robert/Snell, William/Swetnam, Larry	Enhancing Burley Tobacco Produciton Labor Effciency 2016	Council for Burley Tobacco		$10,000	**$10,000**
Sama, Michael	Sama, Michael/Dvorak, Joseph/Mark, Tyler/McNeill, S/Montross, Michael	Dev. Of A Can-Based Data Management and Decision Support System For Optimal Equipmetn And Harvest Timing From Grain Harvast To Storage	National Institute of Food and Agriculture	$500,000		**$500,000**
Sanderson, Wayne	Sanderson, Wayne/Anderson, Debra/Ashford, Kristin/Browning, Steven/Bunn, Terry/Hahn, Ellen/Honaker, Rick/Mannino, David/Purs..	Central Appalachian Regional Education Research Center	National Institute of Occupational Safety and Health		$1,014,022	**$1,014,022**
Smith, Suzanne	Smith, Suzanne/Bailey, Sean/Guzman, Marcelo/Hoagg, Jesse/Sama, Michael	NSF EPSCoR: RII Track-2 FEC: Unmanned Aircraft System for Atmospheric Physics	Oklahoma State University		$700,000	**$700,000**
Taraba, Joseph	Taraba, Joseph/Edwards, Dwayne/Lee, Brad/Sama, Michael	Phosphorus Runoff Potential and Nitrogen Flux Emissions From Compost Generated in Compost Bedded Dairy Pack Barns	Natural Resources Conservation Service	$75,000		**$75,000**
	Taraba, Joseph/Reed, Michael/Sama, Michael	Borlaug 2015 Mexico (Cuchillo) GRA @UKY	Foreign Agricultural Service	$29,028		**$29,028**
WELLS, LARRY	WELLS, LARRY	Support of the French Tobacco Sector in Utilization of a Recently Developed High Capacity Market Preparation System for Air-cured Burley Tobacco	Arvalis Institut du Vegetal	$15,000		**$15,000**
		Support of the French Tobacco Sector in Utilization of a Recently Developed High Capacity Market Preparation System for Air-cured Burley Tobacco and ..	Arvalis Institut du Vegetal	$14,940		**$14,940**
Wendroth, Ole	Wendroth, Ole/Knott, Carrie/Lee, Chad/Murdock, Lloyd/Sama, Michael	DEVELOPING IRRIGATION MANAGEMENT STRATEGIES FOR SOYBEAN PRODUCTION IN HUMID REGIONS OF THE SOUTHERN US	Southern Soybean Research Program		$50,000	**$50,000**
Total				***$1,041,099***	***$12,176,822***	**$13,217,921**

Note: Primary total includes all dollars for projects assigned to that department/unit--the prime department of the contact PI or the unit primarily responsible for the proposal. Collaborations are based on co-I involvement on projects outside of the department. Collaboration dollars (value) equals the total award for that project during the fiscal year. It DOES NOT represent the enrichment split or the faculty percent effort on the grant project.

*Source: OSPA Database, updated: 11/30/2017 (**FY18 includes July 1, 2017 through November 30, 2017**)*
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Primary and Collaborative Project Totals (Details)

College of Agriculture, Food and Environment, Department: **Biosystems & Ag Eng**

Fiscal Year Ending FY 2017

Project PI	Investigator List	Project Title	Sponsor Name	Primary Total	Collaboration	*Total*
Agouridis, Carmen	Agouridis, Carmen	Hydraulic Flume Demonstration of Backwater Effects	Hopkinsville Surface and Stormwater Utility	$4,055		**$4,055**
BARTON, CH RISTOPHER	Barton, Christopher/Agouridis, Carmen/Yeager, Kevin	Evaluating the Influence of the Forestry Reclamation Approach on Hydrology and Water Quality in Appalachian Coal Minesp	Surface Mining Reclamation and Enforcement		$195,490	**$195,490**
Bradley, Carl	Bradley, Carl/Stombaugh, Timothy	Improving Fungicide Application Recommendations for Managing Fusarium Head Blight of Wheat and Barley	Kentucky Small Grain Growers Association		$14,130	**$14,130**
COLLIVER, DONALD	Colliver, Donald/Badurdeen, F/Cheung, Sen-Ching/Henninger, John/Holloway, Lawrence/Sekulic, Dusan	Kentucky Industrial Assessment Center (KIAC): Developing the Next Generation Energy Assessment Engineering Workforce	Department of Energy		$305,000	**$305,000**
CROCKER, MARK	Crocker, Mark/Crofcheck, Czarena/Wilson, Michael	A microalgae-based platform for the beneficial reuse of CO2 emissions from power plants	Department of Energy		$484,651	**$484,651**
Dvorak, Joseph	Dvorak, Joseph/Goff, Ben/Jackson, Joshua/Montross, Michael/Sama, Michael	LIDAR and Photogrammetry to Map Alfalfa Yield and Quality Using Unmanned Aircraft Systems	National Institute of Food and Agriculture	$250,000		**$250,000**
	Dvorak, Joseph/McNeill, S/Shockley, Jordan	Wet Soybean Delivery Advice App	Kentucky Soybean Promotion Board	$13,945		**$13,945**
	Dvorak, Joseph/Sama, Michael	KSEF RDE: Efficient Routing with Multiple Vehicles for Agricultural Area Coverage Tasks	KY Science and Technology Co Inc	$30,000		**$30,000**
	Dvorak, Joseph/Stombaugh, Timothy	LP Hybrid Forklift Demonstration	Propane Education and Research Council	$97,527		**$97,527**
Fehr, Robert	Fehr, Robert	FY-17 Kentucky Radon Education Program	KY Cabinet for Health and Family Services	$26,054		**$26,054**
		Kentucky Energy Education Outreach Program	KY Energy and Environment Cabinet	$100,000		**$100,000**
Higgins, Stephen	Higgins, Stephen/Stringer, Jeffrey	Winter Feeding and Other Cattle Best Management Practices	KY Department of Environmental Protection	$221,363		**$221,363**
Lee, Brad	Lee, Brad/Edwards, Dwayne	Blue Water Farmes: Edge-of-Field Monitoring in Kentucky Soils	Kentucky Soybean Promotion Board		$206,184	**$206,184**
Mannino, David	Mannino, David/Ingram, Richard/Mazur, Joan/Namkoong, Kang/Purschwitz, Mark/Sanderson, Wayne/Swanson, Mark/Vincent,..	Southeast Center for Agricultural Health and Injury Prevention	National Institute of Occupational Safety and Health		$1,329,742	**$1,329,742**
McNeill, S	McNeill, S	Alliance for Food Security Through Reduction of Postharvest Loss and Food Waste	Oklahoma State University	$20,654		**$20,654**
		AMPLIFIES Ghana: Assisting Management in the Poultry and Layer Industries by Feed Improvement and Efficiency Strategies in Ghana	Oklahoma State University	$29,086		**$29,086**
		Nigeria Capacity Building on Stored Commodities	Foreign Agricultural Service	$15,489		**$15,489**
	McNeill, S/Montross, Michael/Overhults, Douglas	Technical Assistance for Energy Use on Kentucky Farms	Rural Development	$76,270		**$76,270**
Montross, Michael	Montross, Michael/McNeill, S	Factors that Affect Packing During Storage	Ohio State University	$25,453		**$25,453**
Nokes, Sue	Nokes, Sue/Knutson, Barbara/Lynn, Bert/Rankin, Stephen/Shi, Jian	RII Track-2 FEC: Assembling Successful Structures: Lignin Beads for Sustainability of Food, Energy, and Water Systems	Louisiana State University	$500,000		**$500,000**
ORMSBEE, LINDELL	Ormsbee, Lindell/Agouridis, Carmen/Brion, Gail/Edwards, Dwayne/Fryar, Alan/Lee, Brad/Price, Steven/Salmeron Cortasa, Mo..	104B State Water Resources Research Institute Program 2016 - 2021	US Geological Survey		$92,335	**$92,335**
Sanderson, Wayne	Sanderson, Wayne/Anderson, Debra/Ashford, Kristin/Browning, Steven/Bunn, Terry/Hahn, Ellen/Honaker, Rick/Mannino, David/Purs..	Central Appalachian Regional Education Research Center	National Institute of Occupational Safety and Health		$1,009,308	**$1,009,308**
Stombaugh, Timothy	Stombaugh, Timothy/Dvorak, Joseph	Improving the Accuracy of Chemical Applications with Direct Injection	National Institute of Food and Agriculture	$498,726		**$498,726**
WELLS, LARRY	WELLS, LARRY	Support of the French Tobacco Sector in Utilization of a Recently Developed High Capacity Market Preparation System for Air-cured Burley Tobacco	Arvalis Institut du Vegetal	($65)		**($65)**
Wendroth, Ole	Wendroth, Ole/Knott, Carrie/Lee, Chad/Murdock, Lloyd/Sama, Michael	DEVELOPING IRRIGATION MANAGEMENT STRATEGIES FOR SOYBEAN PRODUCTION IN HUMID REGIONS OF THE SOUTHERN US	Southern Soybean Research Program		$50,000	**$50,000**
Total				***$1,908,557***	***$3,686,840***	**$5,595,397**

Note: Primary total includes all dollars for projects assigned to that department/unit--the prime department of the contact PI or the unit primarily responsible for the proposal. Collaborations are based on co-I involvement on projects outside of the department. Collaboration dollars (value) equals the total award for that project during the fiscal year. It DOES NOT represent the enrichment split or the faculty percent effort on the grant project.

*Source: OSPA Database, updated: 11/30/2017 **(FY18 includes July 1, 2017 through November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

Appendix D – BAE Grants by Sponsor Type FY 2012-2017

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2012

College/Unit	Dept. Name	Rollup	Federal		State	
			Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$1,326,390	60.2%	$334,219	15.2%
Grand Total			**$1,326,390**	**60.2%**	**$334,219**	**15.2%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2012

			Industry		Other	
College/Unit	**Dept. Name**	**Rollup**	Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$134,517	6.1%	$408,533	18.5%
Grand Total			**$134,517**	**6.1%**	**$408,533**	**18.5%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2012

College/Unit	Dept. Name	Rollup	Total Awards	Total % of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$2,203,659	100.0%
Grand Total			**$2,203,659**	**100.0%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2013

College/Unit	Dept. Name	Rollup	Federal		State	
			Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$5,975,186	85.5%	$617,949	8.8%
Grand Total			**$5,975,186**	**85.5%**	**$617,949**	**8.8%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2013

			Industry		Other	
College/Unit	**Dept. Name**	**Rollup**	Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$41,000	0.6%	$355,896	5.1%
Grand Total			**$41,000**	**0.6%**	**$355,896**	**5.1%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2013

College/Unit	Dept. Name	Rollup	Total Awards	Total % of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$6,990,031	100.0%
Grand Total			**$6,990,031**	**100.0%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2014

			Federal		State		Industry
College/Unit	**Dept. Name**	**Rollup**	Awards	% of Total	Awards	% of Total	Awards
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$68,821	11.6%	$100,000	16.8%	$335,000
Grand Total			**$68,821**	**11.6%**	**$100,000**	**16.8%**	**$335,000**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2014

			Industry	Other		Total	
College/Unit	**Dept. Name**	**Rollup**	% of Total	Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	56.4%	$90,326	15.2%	$594,147	100.0%
Grand Total			**56.4%**	**$90,326**	**15.2%**	**$594,147**	**100.0%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2015

College/Unit	Dept. Name	Rollup	Federal		State		Industry
			Awards	% of Total	Awards	% of Total	Awards
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$163,261	28.3%	$197,528	34.3%	$79,431
Grand Total			**$163,261**	**28.3%**	**$197,528**	**34.3%**	**$79,431**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2015

College/Unit	Dept. Name	Rollup	Industry	Other		Total	
			% of Total	Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	13.8%	$136,153	23.6%	$576,373	100.0%
Grand Total			**13.8%**	**$136,153**	**23.6%**	**$576,373**	**100.0%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2016

College/Unit	Dept. Name	Rollup	Federal		State	
			Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$867,469	83.3%	$112,720	10.8%
Grand Total			**$867,469**	**83.3%**	**$112,720**	**10.8%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2016

			Industry		Other	
College/Unit	**Dept. Name**	**Rollup**	Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$20,000	1.9%	$40,910	3.9%
Grand Total			**$20,000**	**1.9%**	**$40,910**	**3.9%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2016

College/Unit	Dept. Name	Rollup	Total Awards	Total % of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$1,041,099	100.0%
Grand Total			**$1,041,099**	**100.0%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2017

College/Unit	Dept. Name	Rollup	Federal		State	
			Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$840,485	44.0%	$347,417	18.2%
Grand Total			**$840,485**	**44.0%**	**$347,417**	**18.2%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

University of Kentucky Sponsored Project Award Funding

Awards by Sponsor Type

College of Agriculture, Food and Environment

Fiscal Year Ending FY 2017

College/Unit	Dept. Name	Rollup	Other		Total	
			Awards	% of Total	Awards	% of Total
College of Agriculture, Food..	Biosystems & Ag Eng	81050	$720,655	37.8%	$1,908,557	100.0%
Grand Total			**$720,655**	**37.8%**	**$1,908,557**	**100.0%**

Source: OSPA Database, updated: 11/30/2017 ***(FY18 data from July 1st - November 30, 2017)***
Compiled by: University of Kentucky, Office of the Vice President for Research

Appendix E – BAE Graduate Program Assessment

Department of Biosystems and Agricultural Engineering
Master of Science Program Assessment Plan

Mission Statement

The Biosystems and Agricultural Engineering (BAE) Master of Science program provides students with advanced technical training in their field of study as well as the basic skills required to assess, conduct and communicate engineering research.

Statement of Learning Outcomes and Curricular Map

The learning outcomes of our Master of Science program are:

1. Acquire advanced knowledge within a selected field of specialization.
2. Critically assess the scientific merit and practical implications of technical literature and presentations.
3. Learn and apply basic principles required to conceive, conduct, manage and analyze supervised engineering research and/or design.
4. Use state-of-the-art technology as tools in engineering design and in collecting/analyzing experimental data.
5. Gain proficiency in communicating technical subjects in both written and oral forms.

Our curriculum (map given below) provides significant flexibility in course work depending on individual research interests but provides a common base of knowledge that enables students to achieve the learning outcomes described above.

BAE Master of Science Curriculum Map

Learning outcome	BAE 775 Professional Practices Seminar	BAE 658 Instrumentation	Thesis or Project Report	Final Exam
1. Advanced knowledge		I	A	E
2. Critical assessment	I		A	E
3. Engineering research/design	I	R	A	E
4. State of the art technology		I	A	E
5. Communication	I		A	E

I- outcome introduced
R- outcome reinforced
E- outcome emphasized
A- outcome applied

Assessment Responsibilities

Students will be assessed annually (January) for learning outcomes by the department's Director of Graduate Studies with reports findings sent by the following month (February) to the department's Student Services Coordinator for compilation of statistics. The Graduate Studies Committee will use the statistics for program review as outlined below. Recommendations will be developed in the March-April timeframe based on the program review and taken to the full faculty during the May faculty meeting for discussion and implementation of any changes deemed necessary.

Program Assessment Methods and Procedures

Program assessment will include both direct and indirect measures of learning.

A. Indirect evidence of learning

1. Statistics on grades earned in the two core courses of BAE 658 and 775 will be calculated annually (January). This is an indirect measure of learning outcomes 1 and 4 (BAE 658) and outcomes 2, 3 and 5 (BAE 775).
2. Numbers of manuscripts accepted in peer-reviewed journals will be tabulated annually (January) as an indirect measure of outcomes 1, 3 and 5.
3. Number of presentations at local, regional, national, and international conferences will be tabulated annually (January) as an indirect measure of outcomes 1 and 5.

B. Direct evidence of learning (Artifacts)

Artifacts as given in the Artifact Map and described below will be collected for each student as direct evidence of learning.

1. Students will be assessed for quality of oral presentations as a part of the requirements for BAE 775 and the final examination. A jury of three faculty members will assess the student's oral presentations during BAE 775 using the rubric below.
2. As part of the final examination, each student will deliver an oral presentation. Each member of the student's advisory committee members will evaluate the presentation using the same rubric as described for 1. above.
3. As a part of the final examination, the advisory committee will assess the student both in terms of their achievement of all specified learning outcomes. The evaluation rubric is included below.

Assessment Cycles

The average number of MS graduates (approximately five per year over the last five years) suggests that two years' data are required to provide meaningful input to the Graduate Studies Committee and departmental faculty in the context of identifying beneficial changes. However, all data collection measures as described above will begin in January 2011 with the first assessment to be held in May 2013. We will also examine trends over multiple cycles once we have sufficient data for comparison. Accumulation of indirect evidence of learning (grades, manuscripts published and presentations at conferences) has been ongoing for years and provides a program baseline. Those data will be tabulated and evaluated beginning January 2011. Direct measures of learning will be implemented January 2011.

Artifact Map

		OUTCOMES				
		1. Acquire advanced knowledge within a selected field of specialization.	2 Critically assess the scientific merit and practical implications of technical literature and presentations.	3. Learn and apply basic principles required to conceive, conduct, manage and analyze supervised engineering research and/or design.	4. Use state-of-the-art technology as tools in engineering design and in collecting/analyzing experimental data.	5. Gain proficiency in communicating technical subjects in both written and oral forms.
Artifacts	Oral presentation (First)		1st Year			1st Year
	Oral Presentation (Second)	Thesis defense	Thesis defense	Thesis defense	Thesis defense	Thesis defense
	Final Exam	Thesis defense	Thesis defense	Thesis defense	Thesis defense	Thesis defense

BAE 775 Speaker Review Form

Student Speaker: Date:
Presentation Title:
Reviewer:

Evaluation Criterion	Excellent 4	Good 3	Average 2	Deficient 1	Score
Demonstrate the ability to use technical tools	Familiar with the A/V equipment, slides easy to read and not overcrowded, heard audibly form every seat in the room, all crucial slides presented long enough for viewing, projected images easily viewable, no typos or slides out of order	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Technical bugs not worked out in advance, projection of color choices and slide layouts difficult to read, speaker didn't project well enough to be heard all over the room, went through some slides too fast, overcrowded slides, multiple typos	
Able to speak effectively	Speaker spoke clearly and with an appropriate tempo, there were no distractive movements or gestures by the speaker, the speaker maintained audience attention with eye contact, voice inflection, facial expression, avoided jargon and used simple language, talk was targeted appropriately to the audience	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Tempo was either too fast or too slow, speaker had a distractive movement, speaker didn't engage with the audience, speech was full of jargon and not targeted appropriately to the audience	
Able to construct an effective oral presentation with a clear introduction, middle, and conclusion	There was a distinct introduction making it clear what the talk would be about and providing rationale for the work. The middle section was distinct with clear explanation of the techniques and main results, complex ideas simply explained, crucial technical terms clearly defined. The conclusion section was distinct with a summary of the important results and ideas, a clear take home message, applications to future work were clearly defined.	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Important background information and rationale for the work was not clearly articulated in the introduction. The middle section was technically difficult to follow and not appropriately targeted to the audience. The conclusions section was just a summary without the speaker putting the work into a larger context including how the results contribute to the scientific knowledge in the field and what future directions to take.	
Able to field questions effectively	The talk stimulated interesting questions, not just clarification of the technical aspects of the work. The speaker repeated questions or paraphrased to clarify and strived to understand questions that were unclear. Questions were answered appropriately. The speaker demonstrated a depth of knowledge about the field and was able to critically apply this knowledge to his/her own work.	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	There were few questions generated about the content, just clarification of technical aspects that were not clearly presented. The speaker answered questions inappropriately due to failure to understand the question or a failure to understand the larger context of the field. The speaker became flustered or frustrated during the questioning.	

Strengths:

Suggestions for improvement:

Overall Evaluation: excellent good average deficient

BAE Master of Science Final Exam Rubric

Student:
Date of Exam:
Exam Committee Members:

Learning outcomes	Excellent 4	Competent 3	Marginal 2	Deficient 1	Insufficient data to assess 0	SCORE
Acquire advanced knowledge within a selected field of specialization.	Demonstrates a thorough knowledge of the supporting technical topics, work advances the state of the art and suitable for peer-reviewed publication.	Demonstrates familiarity with underlying technical foundations of the topic, work is consistent in quality and contribution to recently published studies	Demonstrates awareness of some of the technical foundations, contribution extends only slightly beyond textbook knowledge.	Major deficiencies in understanding of the technical background of the topic, key concepts are missing or incorrectly applied.		
Critically assess the scientific merit and practical implications of technical literature and presentations.	Demonstrates a thorough understanding of content and scientific context. Uses appropriate and relevant sources to explore ideas within the discipline and to critically develop a well-articulated scientific theme. Clear demonstration of independent intellectual contribution, creativity, and original thinking.	Demonstrates an adequate understanding of content and scientific context. Uses appropriate and relevant sources to critically develop a scientific theme. Follows and presents literature reasonably well. Demonstrates some insight and creativity	Demonstrates awareness of content and scientific context. Uses appropriate and relevant sources that are applied through most of the work. Organization of ideas not always logical or consistent with composing a scientific argument. Minimal evidence of original thinking.	Demonstrates minimal awareness of content and scientific context. Uses appropriate and relevant sources to develop limited areas of this work. Examples of inappropriate literature citations common. Frequent lapses of logic when composing a scientific argument. Lack of creativity or original thinking.		
Learn and apply basic principles required to conceive, conduct, manage and analyze supervised engineering research and/or design.	Demonstrates a thorough understanding of the scientific method, clear ability to understand and design complex experimental protocols, analyzes and presents data with a clear and proper interpretation.	Demonstrates good understanding of scientific method, designs experiments appropriate for addressing hypotheses, presents data in an appropriate context.	Demonstrates satisfactory understanding of scientific method, needs some assistance with complex experimental design and analyzing data, can present and interpret data with some guidance from the PI	Demonstrates minimal understanding of scientific method, limited ability to conceive of experimental design to address hypotheses, needs significant faculty input for data analysis and interpretation		
Use state-of-the-art technology as tools in engineering design and in collecting/analyzing experimental data.	Most current tools and instruments are correctly applied with a thorough knowledge of their use.	Tools and instruments are not the most current, good knowledge of their implementation and use.	Dated tools and instruments are used, average understanding of how to use them or how to interpret their results.	Dated and/or misused tools and instruments are used, slight understanding of their use and interpretation.		
Gain proficiency in communicating technical subjects	Articulates intimate understanding of	Has appropriate understanding of the project, able	Has a basic understanding of the project but	Lacks understanding of the project and		

in both written and oral forms.	the project, is able to orally communicate and defend new ideas, thinks effectively on his/her feet, is able to integrate knowledge from multiple disciplines and experience in solving problems.	to articulate ideas but lacks some creativity, can think through basic problems when questioned, has an adequate knowledge base and is able to integrate appropriately to solving problems.	lacks depth, can answer basic questions about the project but has some difficulty thinking on his/her feet, has some gaps in knowledge base and does not effectively use this for problem solving.	unable to communicate rationale for interpretation of data or direction of the project, substantial gaps in knowledge base and is unable to draw from different areas or experiences to solve problems.		

ANNUAL SLO ASSESSMENT REPORT 2015-2016
Office of University Assessment
University of Kentucky

College: COLLEGE OF ENGINEERING
Department: Biosystems and Agricultural Engineering
Degree: MS

Student Learning Outcome (SLO)
State the Student Learning Outcome (SLO). It should be clear, measurable, and directly related to student learning. It should be related to students' performance of knowledge, skills, and abilities, such as papers, projects, or presentations. It should not be related to operational objectives, such as graduation/retention rates or GPAs.
#4 Use state-of-the-art technology as tools in engineering design and in collecting / analyzing experimental data.

Rationale for use of assessment tool and how tool aligns to the Student Learning Outcome
Provide a clear description of the assessment tool/activity/method that was used for this assessment cycle. If there is more than one tool/activity/method, describe each one. If a licensing or certification exam is used, a rationale is provided as to why this exam was selected and how it aligns to the student learning outcome.
Grade in BAE 658 - Instrumentation for Engineering Research
Final Exam Rubric – The thesis examining committee evaluated this SLO and reported on the final exam rubric
Is your program primarily using direct methods (i.e., rubrics, exams, papers, projects, presentations) or indirect methods (i.e., grades, GPA, course pass rates, etc.)?
Direct method in the exam rubic and indirect grades in the instrumentation class.
Explain why the assessment tool/activity/method is appropriate for measuring student learning for the stated outcome.
The graduate instrumentation course is doing a good job in preparing the students on the design process and how to collect and analyze their experimental data. The final exam rubric provides for an overall evaluation at the end of the student's study.

Did you use any other methods to ensure the validity and reliability of your results and/or findings (e.g., multiple data sources, validation of the tool)?
No

Benchmark/Target/Goal

Provide the benchmark/target/goal for the assessed student learning outcome. Be specific and explain how the benchmark/target/goal was determined.
The goal was 3.5 average in BAE 658. These goals were determined by the faculty in a meeting. Fourteen MS students were enrolled in BAE 658 during the fall semester in 2012, 2013, and 2015
The goal was 3.5 average on this question in the final exam rubic.

Data Collection (includes time/semester and place, sampling process, population description, and data review process)

Provide a complete explanation of each data collection process and protocol so the reviewer fully understands the data collection methodology.
The grades were assigned by the instructor in the course.
Each member of the examining committee evaluated the student on this topic as excellent (4), Competent (3), Marginal (2) or Deficient (1).
Did you use any processes to ensure the quality of the data (e.g., two or more reviewers, or a different, secondary validation method, Cronbach's alpha)?
Each member of the examining committee scored the rubric and the results were averaged.
If you used a rubric or scoring guide, is it appended to this report?
Yes.

Results

Please present your assessment results below. Results should be specific and disaggregated in a visual representation (charts and graphs) that is easily understood by an external reviewer. For example, if a rubric was used to assess the student work, break down the results by each achievement category and performance criterion. If a licensing or certification exam is used, the results are disaggregated. For example, the results are broken down by demographics, content areas, or sections. Pass rates should not be the only results provided.
There were 9 "A" grades and 5 "B" grades for the last three times this course has been taught.
The average results for the Final Exam Rubric was 3.45.

Interpretation of Results

Which people/committees/groups participated in the interpretation of the results? How were these results communicated to faculty and/or stakeholders?
The faculty member teaching this course has extensive training in experimentation and instrumentation. The class is geared to teaching the student in designing experiments and equipment to collect and analyze data that is focused on the student's research project. The student's major advisor is made aware of the student's performance in the class and is involved in the individual's project.
The faculty advisor is responsible for collecting the final exam rubric and therefore they get immediate feedback.
Please explain the results. Include things like:

a. Your program's level of satisfaction with the results
b. An explanation of how the past/current curriculum/co-curriculum might have impacted the results

The class was discussed and evaluated at a recent faculty retreat. The faculty are very pleased with the class, how it is being taught, and the information being gained by the students. This course was revised and introduced by a new faculty member starting with the fall 2012 semester and this is a new method of evaluation.
The Exam Rubric is evaluated on an annual basis.
What are the limitations of this assessment research and/or findings?
There needs to be additional data collected on the results of the individual components of the class (for example separating out the grades for the project and the individual components of the class).

There are variations in faculty expectations and therefore is not a uniformity of faculty evaluating the final exams. The sample size is not large enough to standardize each individual faculty's scoring to normalize the scores between students.

Were multiple years of data used to help interpret the results? If so, are then any trends, consistencies, or inconsistencies? If so, please report.

Three years of data were used in the analysis. There were no trends identified due to the small amount of data for each year.

Did you meet your anticipated benchmark/target/goal? Why or why not?

Partially.

The goal of an average grade of 3.5 for the class was exceeded as the average grade was 3.64 for the 14 students.

The goal of 3.5 was not met in the final exam rubic as the average grade was 3.45.

Reflection of Results and Assessment Process

How do the reported results and/or findings effect your improvement actions?

The methods reported indicate an acceptable level of performance. It should be noted that not all students earned an "A" in the class and additional improvements could be made.

Reflect on your assessment process and results. Do you think these results are valid and/or reliable?

This appears to be a valid method of evaluating this area.

Are the results sufficient to make informed decisions to improve student learning? Why or why not?

Yes. The instructor evaluation of the student's progress provides feedback on the class and each time it is taught there is a fine-tuning to improve what/how it is taught and the material covered.

Do you plan to make changes to assessment or data collection process(es)?

Each student is supposed to present two seminars. We plan on adding questions relating to this topic on the seminar evaluations.

Actions Intended for the Improvement of Student Learning

Provide a discussion of your intended improvement actions that focus specifically on student learning. Explain why or how the improvement action is expected to positively affect the learning outcome.

Additional emphasis on this topic will be included in our Seminar class.

Discuss any causation or associated details identified in your assessment activities (e.g., approximate dates of and person(s) responsible for implementation, and where in curriculum/activities and department/program they will occur; how results and intended improvement actions will impact SLO).

The results of this evaluation will be discussed in faculty meeting within the next six months

If applicable, provide a discussion of any empirical or research based evidence that supports your intended improvement actions.

None are known at this time.

Additional Insights or Reflection [This section is not scored]

Are there any insights you would share regarding your assessment efforts?

The MS rubric is very effective in being able to get the input from individual faculty however there appears to be considerable variation in faculty expectations in evaluating the same individual. A discussion will be held in a future faculty meeting on this topic.

If you have additional notes regarding your assessment efforts that should be considered in future reflections of this work, please include them below.

No response.

Is there any other work being done in the program that may not be directly related to the learning outcome that you would like to share? If so, please provide that information below.

No response.

Appendix: Final Exam Rubric

Learning outcomes	Excellent 4	Competent 3	Marginal 2	Deficient 1	Unable to Assess 0	SCORE
Use state-of-the-art technology as tools in engineering design and in collecting/analyzing experimental data.	The most current tools and instruments are correctly applied with a thorough knowledge of their use.	Tools and instruments are not the most current, good knowledge of implementation and use.	Dated tools and instruments are used, average understanding of their use or how to interpret their results.	Dated and/or misused tools and instruments are used, minimal understanding of their use and interpretation.		

Student Learning Outcome (SLO)

State the Student Learning Outcome (SLO). It should be clear, measurable, and directly related to student learning. It should be related to students' performance of knowledge, skills, and abilities, such as papers, projects, or presentations. It should not be related to operational objectives, such as graduation/retention rates or GPAs.

#2 Critically assess the scientific merit and practical implication of technical literature and presentations

Rationale for use of assessment tool and how tool aligns to the Student Learning Outcome

Provide a clear description of the assessment tool/activity/method that was used for this assessment cycle. If there is more than one tool/activity/method, describe each one. If a licensing or certification exam is used, a rationale is provided as to why this exam was selected and how it aligns to the student learning outcome.

Two tools were used to asses this SLO.

Grades in BAE 775 – Professional Practices Seminar (Fall Semester sections on Logical Critique of Published Articles)

Final MS Exam Assessment – Q&A by committee members with results recorded on a 0-4 range rubric.

Is your program primarily using direct methods (i.e., rubrics, exams, papers, projects, presentations) or indirect methods (i.e., grades, GPA, course pass rates, etc.)?

Direct methods for both the Final Exam Rubric and the Technical Communications Exam in BAE775

Explain why the assessment tool/activity/method is appropriate for measuring student learning for the stated outcome.

Both of these directly evaluate the SLO.

Did you use any other methods to ensure the validity and reliability of your results and/or findings (e.g., multiple data sources, validation of the tool)?
No.

Benchmark/Target/Goal

Provide the benchmark/target/goal for the assessed student learning outcome. Be specific and explain how the benchmark/target/goal was determined.
The target goal was an average of an A grade in BAE775 exam and an average of 3.0 on the Final Exam Rubric.

Data Collection (includes time/semester and place, sampling process, population description, and data review process)

Provide a complete explanation of each data collection process and protocol so the reviewer fully understands the data collection methodology.
The grades were assigned by the instructor in the course.
Each member of the examining committee evaluated the student on this topic as excellent (4), Competent (3), Marginal (2) or Deficient (1).
Did you use any processes to ensure the quality of the data (e.g., two or more reviewers, or a different, secondary validation method, Cronbach's alpha)?
Each member of the examining committee scored the rubric and the results were averaged.
If you used a rubric or scoring guide, is it appended to this report?
Yes.

Results

Please present your assessment results below. Results should be specific and disaggregated in a visual representation (charts and graphs) that is easily understood by an external reviewer. For example, if a rubric was used to assess the student work, break down the results by each achievement category and performance criterion. If a licensing or certification exam is used, the results are disaggregated. For example, the results are broken down by demographics, content areas, or sections. Pass rates should not be the only results provided.
The grade achieved by each of the 15 students in the BAE 775 class over this topic was an "A"
The average score for the final exam rubric was 2.92.

Interpretation of Results

Which people/committees/groups participated in the interpretation of the results? How were these results communicated to faculty and/or stakeholders?
The faculty member teaching this course developed the course to be part of this process. The course was introduced to address many of the items used by the BAE Department in evaluating learning outcomes. The material covered in the course was reviewed extensively by the graduate faculty before the course was approved.
The faculty advisor is responsible for collecting the final exam rubric and therefore they get immediate feedback.
Please explain the results. Include things like:

a. Your program's level of satisfaction with the results
b. An explanation of how the past/current curriculum/co-curriculum might have impacted the results

The class was discussed and evaluated at a recent faculty retreat. It was concluded that it should be taken by each of the graduate students.
The Exam Rubric is evaluated on an annual basis.
What are the limitations of this assessment research and/or findings?
There are variations in faculty expectations and therefore is not a uniformity of faculty evaluating the final exams. The sample size is not large enough to standardize each individual faculty's scoring to normalize the scores between students.
Were multiple years of data used to help interpret the results? If so, are then any trends, consistencies, or inconsistencies? If so, please report.
Yes. There is insufficient data to identify any trends or inconsistencies.

Did you meet your anticipated benchmark/target/goal? Why or why not?
Partially.
The goal of an average grade of 3.5 for the class was exceeded as the average grade for the exam was an A for the 15 students. (Fall semesters 2013, 2014, 20150
The goal of 3.0 was not met in the final exam rubric as the average grade was 2.93

Reflection of Results and Assessment Process

How do the reported results and/or findings effect your improvement actions?
The methods reported indicate an acceptable level of performance in the class.
Results as analyzed by the DGS for the final exam rubric are less than the target. Based upon review of the rubric and in discussions with students' advisors the group might not be representative of the total population.
Reflect on your assessment process and results. Do you think these results are valid and/or reliable?
There are variations in faculty expectations and therefore is not a uniformity of faculty evaluating the final exams. The sample size is not large enough to standardize each individual faculty's scoring to normalize the scores between students.

Are the results sufficient to make informed decisions to improve student learning? Why or why not?
Yes.
The instructor evaluation of the student's progress provides feedback on the class and each time it is taught there is a fine-tuning to improve what/how it is taught and the material covered.
The exam rubric is collected by the students' major professor and each professor then can adjust what needs to be stressed in future students.
Do you plan to make changes to assessment or data collection process(es)?
This will be a topic of a faculty meeting within the next six months. Each student is supposed to present two seminars. It is expected that questions relating to this topic will be added to the seminar evaluations.

Actions Intended for the Improvement of Student Learning

Provide a discussion of your intended improvement actions that focus specifically on student learning. Explain why or how the improvement action is expected to positively affect the learning outcome.
Greater emphasis will be placed on this topic by the individual faculty members as they work with the students preparing for their thesis literature review.
Discuss any causation or associated details identified in your assessment activities (e.g., approximate dates of and person(s) responsible for implementation, and where in curriculum/activities and department/program they will occur; how results and intended improvement actions will impact SLO).
This will be a topic of a faculty meeting within the next six months.
If applicable, provide a discussion of any empirical or research based evidence that supports your intended improvement actions.
None are known at this time.

Additional Insights or Reflection [This section is not scored]

Are there any insights you would share regarding your assessment efforts?
The MS rubric is very effective in being able to get the input from individual faculty however there appears to be considerable variation in faculty expectations in evaluating the same individual. A discussion will be held in a future faculty meeting on this topic.
If you have additional notes regarding your assessment efforts that should be considered in future reflections of this work, please include them below.
No response.
Is there any other work being done in the program that may not be directly related to the learning outcome that you would like to share? If so, please provide that information below.
No response.

APPENDIX: Final Exam Rubric

Learning outcomes	Excellent 4	Competent 3	Marginal 2	Deficient 1	Unable to Assess 0	SCORE
Critically assess the scientific merit and practical implications of technical literature and presentations.	Thorough understanding of content and scientific context. Uses appropriate sources to explore ideas and to develop a well-articulated scientific theme. Clearly demonstrates creativity and original thinking.	Adequate understanding of content and scientific context. Uses appropriate sources to develop a scientific theme. Presents literature reasonably well. Demonstrates some insight and creativity	Aware of content and scientific context. Uses appropriate sources through most of the work. Ideas not always logical or consistent with scientific argument. Minimal original thinking.	Minimal awareness of content and scientific context. Appropriate sources are limited, inappropriate literature citations are common. Frequent lapses of logic during scientific argument. Lack of creativity or original thinking.		

UNIVERSITY OF KENTUCKY
College of Engineering

Annual Student Learning Outcomes Assessment Report

Academic Year: 2014-2015

Department: _____BAE_____ Program: ____BAE_____ Degree: ___Master of Science_____

Prepared by: __Donald Colliver_____ Phone Number: __859-218-4348_____

(Please complete one table for each outcome you are assessing following the "SLO Assessment Report Rubric" rev May 2015)

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #/ltr: ID#3: Learn and apply basic principles required to conceive, conduct, manage and analyze supervised engineering research and/or design.	**ASSESSMENT METHODS & TOOLS:** a. Grades in BAE 775, Professional Practices Seminar, Research Principles Exam. b. Final MS Exam Assessment (Q&A by committee members with results recorded on a standardized 0-4 range rubric) with results forwarded to the DGS for tabulation. **TARGET / BENCHMARK:**	a. BAE 775, was introduced as part of this process. It has been taught each fall and spring semester since the fall of 2012 with an average attendance of 8.5 students. The average grade was 94.6 (SD=1.9, n=51) for the students for the six semesters it has been taught. b. A question asking the extent the student had achieved this learning outcome is posed on the MS Exam Assessment that is	a. From evaluation of the students' grades in the class it appears as though the students have gotten a basic understanding of these principles. b. Results as analyzed by the DGS exceed the target. Based upon comparison to the scores since the last period it appears as though no significant improvement is being made in this area. It should be noted that there were only five students evaluated previously and one outstanding student	a. We will continue to teach BAE 775 in the fall and spring semesters. Since there was little scatter in the scores, a better recording of the individual components of the class will give guidance on what part of the class needs improvement. b. Continue collecting data on graduating students and compare data between evaluation periods to determine whether the course material is producing improvements in this outcome - with a view toward modifying this portion of the course as necessary to meet and exceed	**The "Reflection" column should not be populated at this time – programs will need a few months to reflect on their actions before completing this field.**

	a. Average grade of at least 90% in BAE 775. b. Average rating of at least 3.0 on applicable Assessment items.	completed by each member of the student's committee at the end of their defense. Average score from the Final MS Exam Assessments of this outcome is currently 3.0 (SD=0.47, n=16). The previous time this was evaluated the average score was 3.1 (SD=0.61, n=5)	skewed the scores. It was noted that the three students that received the lowest average scores on the evaluation also had the largest number of external committee members who had not used the evaluation form before.	the target. It will be recommended to the student's major professor that the evaluation learning outcome assessment criteria be discussed before the exam. In an attempt to evaluate if there might be are biases or inconsistencies in scoring, the names of the evaluators will be tracked on the assessment forms. Currently the same assessment evaluation criteria are used for students doing Plan A or Plan B Masters programs. Evaluation metrics for students completing the MS using a non-thesis option need to be revised.	

UNIVERSITY OF KENTUCKY
College of Engineering
Annual Student Learning Outcomes Assessment Report
Academic Year: 2013-2014

Department: Biosystems and Agricultural Engineering Program: BAE Degree: MS

Prepared by: Don Colliver Phone Number: 859-218-4348

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #: 1 Acquire advanced knowledge within a selected field of specialization.	**ASSESSMENT METHODS & TOOLS:** i. Specialization coursework ii. Course grades iii. Final Exam Rubric **TARGET / BENCHMARK:** i. Appropriate specialization. ii. 3.5 GPA on plan of study. iii. 3.50 average on M.S. Final Exam Rubric	i. M.S. Plans of Study are individualized for each student with special problem courses utilized if needed. ii. Course grades: The average graduate cumulative GPA for the MS students which graduated this year was 3.808 (range 4.0-3.594) iii. M.S. Final Exam results: The average score on the rubric was 3.61/4.0 (range 2.8-4.0, n=8)	Plans of study indicate appropriate specialization. Initial data indicate target GPA is being exceeded. Data on Final Exam rubric indicate satisfactory progress.	Data are insufficient to justify improvement actions. Data collection and analysis will continue.	

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #: 5 Gain proficiency in communicating technical subjects in both written and oral forms.	**ASSESSMENT METHODS & TOOLS:** i. Oral presentation rubric ii. Final Exam Rubric iii. Presented conference papers. iv. Peer-reviewed publications **TARGET / BENCHMARK:** i. Average of 3.5 on oral presentation rubric ii. 3.50 average on Final Exam Rubric iii. Average of 1.0 conference papers per student during their program. iv. Average of 0.5 peer-reviewed publications per student during their program.	i. Oral presentation results: Eight seminars presented by the MS students were evaluated. The average score on the presentation rubric was 4.32/5.0 (Range 3.5-4.6) ii. Final exam results: The average score on the rubric was 3.61/4.0 (range 2.8-4.0, n=8) iii. Conference papers: 10 conference papers were presented and an additional seven papers were coauthored and presented by major professor iv. Peer-reviewed publications. Nine peer-reviewed papers were published	Data on BAE 775 (oral presentation) are limited. Final Exam data are very limited. Initial data indicate that, on average, conference presentations and peer-reviewed publication goals are being met or exceeded.	Data are insufficient to justify improvement actions. Data collection and analysis will continue, and tools are available to capture conference presentation and peer-reviewed publication data.	

IMPROVEMENT ACTION PLANS

Academic Year: 2012-2013

Department: _Biosystems & Ag Engineering_____ Program: ___Biosystems Engineering_____ Degree: _____MS_____

Prepared by: __Don Colliver_____, Phone Number: ___7-3000x211_____

(Please fill in one table for each outcome you are assessing. The first table provides instructions.)

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #: 2 Critically assess the scientific merit and practical implications of technical literature and presentations.	**ASSESSMENT METHODS & TOOLS:** i. BAE 775 Grades ii. Final Exam Rubric **TARGET / BENCHMARK:** i. 3.50 average in BAE 775 ii. 3.50 average on Final Exam Rubric	8 MS students were enrolled in BAE 775 (Professional Practices Seminar) in the fall of 2012 and they all earned an "A" or 4.0 grade. 7 MS students were enrolled in BAE 775 in the spring of 2013 and they all earned an "A" or 4.0 grade. 5 students were scored on their final exam rubric. The average score was 2.98 on this learning outcome.	The data from the grades from the BAE 775 class indicate a positive response to this learning outcome. However this was scored below the target on the rubric distributed during the final exam. Using the final exam rubric has just started and It is believed that further time needs to be spent in the exam to explain the rubric questions.	The DGS and the Graduate Committee will do additional review and potential clarification of the final exam rubric. Additional emphasis in BAE 775 will be attempted to clarify this learning outcome and making the content it covers more apparent in the thesis.	

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #: 4 Use state-of-the-art technology as tools in engineering design and in collecting/analyzing experimental data.	**ASSESSMENT METHODS & TOOLS:** i. BAE 658 Grades ii. Final Exam Rubric **TARGET / BENCHMARK:** i. 3.50 average in BAE 658 ii. 3.50 average on Final Exam Rubric	8 MS students were enrolled in BAE 658 in the spring 2013. The average grade earned was 3.875 5 students were scored on their final exam rubric. The average score was 3.45 on this learning outcome.	The graduate instrumentation course is doing a good job in preparing the students to collect and analyze their experimental data. While the average value is slightly below the target as evaluated by the Final Exam Rubric, the value indicates this learning outcome is close to being achievable.	Need to continue to have new- state-of-art equipment in the labs and instructors with up-to-date knowledge in this rapidly changing field.	

Improvement Actions Plans for academic year 2011-2012 (Due May 11, 2012)

Department: BAE *Program: BAE* *Degree: Master of Science*

Prepared by: Dwayne R. Edwards *Phone Number: (859) 257-3000, ext. 109*

(Please fill in one table for each outcome you are assessing.)

Student Learning Outcome(s)	Methods	Results (Evidence/Data)	Analysis	Improvement Action
Outcome #2 Critically assess the scientific merit and practical implications of technical literature and presentations.	Assessment Tools: a. Grades in BAE 775, Professional Practices Seminar, Assessment of Technical Communications Exam. b. Final MS Exam Assessment Benchmark/Target: a. Average grade of at least 90%. b. Average rating of at least 3.0 on applicable Assessment items.	a. BAE 775, which was introduced as part of this process, is scheduled to be taught for the first time in Fall 2012. No data are presently available regarding this assessment tool. b. Average score from the Final MS Exam Assessments of this outcome is currently 2.6 (for five students).	a. Not applicable; results will be available and analyzed during the Fall 2012 semester. b. Results as analyzed by the DGS are less than the target. However, based on discussions with students' respective advisors, the group might not be representative of the total population. However, it is also possible that the relatively low scores reflect the lack of focused training to be included in BAE 775.	a. We will teach BAE 775 as scheduled in Fall, 2012. The syllabus is complete as are the majority of materials for this portion of the course. b. Continue collecting data on graduating students and compare data before/after initiation of BAE 775 to determine whether the course material is producing improvements in this outcome with a view toward modifying this portion of the course as necessary to meet and exceed the target. Also, we will meet as a faculty in Summer 2013 to discuss all results and solicit input on any needed curricular modifications.

Student Learning Outcome(s)	Methods	Results (Evidence/Data)	Analysis	Improvement Action
Outcome #3 Learn and apply basic principles required to conceive, conduct, manage and analyze supervised engineering research and/or design.	Assessment Tools: a. Grades in BAE 775, Professional Practices Seminar, Research Principles Exam. b. Final MS Exam Assessment Benchmark/Target: a. Average grade of at least 90%. b. Average rating of at least 3.0 on applicable Assessment items.	a. BAE 775, which was introduced as part of this process, is scheduled to be taught for the first time in Fall 2012. No data are presently available regarding this assessment tool. b. Average score from the Final MS Exam Assessments of this outcome is currently 2.8 (for five students).	a. Not applicable; results will be available and analyzed during the Fall 2012 semester. b. Results as analyzed by the DGS are less than the target. However, based on discussions with students' respective advisors, the group might not be representative of the total population. It is also likely that the results are indicative of the current lack of relatively standardized training on the basic conduct of research, which is to be remedied by BAE 775.	a. We will teach BAE 775 as scheduled in Fall, 2012. The syllabus is complete as are the majority of materials for this portion of the course. b. Continue collecting data on graduating students and compare data before/after initiation of BAE 775 to determine whether the course material is producing improvements in this outcome with a view toward modifying this portion of the course as necessary to meet and exceed the target. Also, we will meet as a faculty in Summer 2013 to discuss all results and solicit input on any needed curricular modifications.

Department of Biosystems and Agricultural Engineering
Doctor of Philosophy Program Assessment Plan

Mission Statement

The Biosystems and Agricultural Engineering (BAE) Doctor of Philosopy (PhD) program provides students with advanced technical training in their field of study as well as the skills required to independently conceive, conduct and communicate engineering research.

Statement of Learning Outcomes and Curricular Map

The learning outcomes of our PhD program are:

1. Combine formal coursework with independent study to achieve subject matter mastery within their selected field of specialization.
2. Gain the competitive skills required to be successful in identifying scientific research topics and acquiring necessary resources.
3. Learn to independently manage personnel, resources, activities and time to accomplish research objectives.
4. Understand the peer-reviewed publication process and successfully use it to disseminate research findings.
5. Competently communicate technical topics to a variety of audiences through proper selection and use of appropriate media and techniques.

Our curriculum (map given below) provides significant flexibility in course work depending on individual research interests with a limited base of common knowledge that enables students to achieve the learning outcomes described above.

BAE Doctor of Philosophy Curriculum Map

Learning outcome	BAE 775 Professional Practices Seminar	Qualifying Exam	Dissertation	Final Exam
1. Subject matter mastery		I	A	E
2. Identify research topics and acquire resources	I	R	A	E
3. Manage personnel, resources, activities and time	I		A	E
4. Understand peer review process	I		A	
5. Communication	I	R	A	E

I- outcome introduced
R- outcome reinforced
E- outcome emphasized
A- outcome applied

Assessment Responsibilities

Students will be assessed annually (January) for learning outcomes by the department's Director of Graduate Studies with reports findings sent by the following month (February) to the department's Student Services Coordinator for compilation of statistics. The Graduate Studies Committee will use the statistics for program review as outlined below. Recommendations will be developed in the March-April timeframe based on the program review and taken to the full faculty during the May faculty meeting for discussion and implementation of any changes deemed necessary.

Program Assessment Methods and Procedures

Program assessment will include both direct and indirect measures of learning.

A. Indirect evidence of learning

1. Statistics on grades earned in the core courses BAE 775 will be calculated annually (January). This is an indirect measure of learning outcomes 2-5.

2. Number of presentations at local, regional, national, and international conferences will be tabulated annually (January) as an indirect measure of outcomes 1-5.

B. Direct evidence of learning (Artifacts)

Artifacts as given in the Artifact Map and described below will be collected for each student as direct evidence of learning.

1. Students will be assessed for quality of oral presentations as a part of the requirements for BAE 775 and the final examination. A jury of three faculty members will assess the student's oral presentations during BAE 775 using the rubric below.

2. The student's advisory committee will assess the student's readiness to continue in the PhD program during the qualifying examination with results recorded on the rubric given below.

3. During the student's final exam, each of the student's advisory committee members will evaluate the student's oral presentation using the same rubric as described in 1. above.

4. As a part of the final examination, the advisory committee will assess the student in terms of their ability to demonstrate achievement of all specified learning outcomes. The evaluation rubric is included below.

Assessment Cycles

The average number of MS graduates (approximately three per year over the last five years) suggests that a minimum of two years' data are required to provide meaningful input to the Graduate Studies Committee and departmental faculty in the context of identifying beneficial changes. However, all data collection measures as described above will begin in January 2011 with the first assessment to be held in May 2013. We will also examine trends over multiple cycles once we have sufficient data for comparison. Accumulation of indirect evidence of learning (grades and presentations at conferences) has been ongoing for years and provides a program baseline. Those data will be tabulated and evaluated beginning January 2011. Direct measures of learning will be implemented January 2011.

Artifact Map

		OUTCOMES				
		1. Combine formal coursework with independent study to achieve subject matter mastery within their selected field of specialization.	2 Gain the competitive skills required to be successful in identifying scientific research topics and acquiring necessary resources.	3. Learn to independently manage personnel, resources, activities and time to accomplish research objectives.	4. Understand the peer-reviewed publication process and successfully use it to disseminate research findings.	5. Competently communicate technical topics to a variety of audiences through proper selection and use of appropriate media and techniques.
Artifacts	Oral presentation (First)					1st Year
	Qualifying Exam	End of 2nd Year	End of 2nd Year			End of 2nd Year
	Oral Presentation (Second)		Dissertation defense	Dissertation defense		Dissertation defense
	Final Exam	Dissertation defense	Dissertation defense	Dissertation defense	Dissertation defense	Dissertation defense

BAE 775 Speaker Review Form

Student Speaker: Date:
Presentation Title:
Reviewer:

Evaluation Criterion	Excellent 4	Good 3	Average 2	Deficient 1	Score
Demonstrate the ability to use technical tools	Familiar with the A/V equipment, slides easy to read and not overcrowded, heard audibly form every seat in the room, all crucial slides presented long enough for viewing, projected images easily viewable, no typos or slides out of order	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Technical bugs not worked out in advance, projection of color choices and slide layouts difficult to read, speaker didn't project well enough to be heard all over the room, went through some slides too fast, overcrowded slides, multiple typos	
Able to speak effectively	Speaker spoke clearly and with an appropriate tempo, there were no distractive movements or gestures by the speaker, the speaker maintained audience attention with eye contact, voice inflection, facial expression, avoided jargon and used simple language, talk was targeted appropriately to the audience	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Tempo was either too fast or too slow, speaker had a distractive movement, speaker didn't engage with the audience, speech was full of jargon and not targeted appropriately to the audience	
Able to construct an effective oral presentation with a clear introduction, middle, and conclusion	There was a distinct introduction making it clear what the talk would be about and providing rationale for the work. The middle section was distinct with clear explanation of the techniques and main results, complex ideas simply explained, crucial technical terms clearly defined. The conclusion section was distinct with a summary of the important results and ideas, a clear take home message, applications to future work were clearly defined.	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	Important background information and rationale for the work was not clearly articulated in the introduction. The middle section was technically difficult to follow and not appropriately targeted to the audience. The conclusions section was just a summary without the speaker putting the work into a larger context including how the results contribute to the scientific knowledge in the field and what future directions to take.	
Able to field questions effectively	The talk stimulated interesting questions, not just clarification of the technical aspects of the work. The speaker repeated questions or paraphrased to clarify and strived to understand questions that were unclear. Questions were answered appropriately. The speaker demonstrated a depth of knowledge about the field and was able to critically apply this knowledge to his/her own work.	Mostly excellent elements with some deficient elements	More excellent elements than deficient elements	There were few questions generated about the content, just clarification of technical aspects that were not clearly presented. The speaker answered questions inappropriately due to failure to understand the question or a failure to understand the larger context of the field. The speaker became flustered or frustrated during the questioning.	

Strengths:

Suggestions for improvement:

Overall Evaluation: excellent good average deficient

BAE Qualifying Exam Assessment

Student:
Date of Exam:
Exam Committee Members:

Learning outcomes	Excellent 4	Competent 3	Marginal 2	Deficient 1	Insufficient data to assess 0	SCORE
Combine formal coursework with independent study to achieve subject matter mastery within their selected field of specialization.	Demonstrates a thorough understanding of content and scientific context. Uses appropriate and relevant sources to explore ideas within the discipline and to critically develop a well-articulated scientific theme. Clear demonstration of independent intellectual contribution, creativity, and original thinking.	Demonstrates an adequate understanding of content and scientific context. Uses appropriate and relevant sources to critically develop a scientific theme. Follows and presents literature reasonably well. Demonstrates some insight and creativity	Demonstrates awareness of content and scientific context. Uses appropriate and relevant sources that are applied through most of the work. Organization of ideas not always logical or consistent with composing a scientific argument. Minimal evidence of original thinking.	Demonstrates minimal awareness of content and scientific context. Uses appropriate and relevant sources to develop limited areas of this work. Examples of inappropriate literature citations common. Frequent lapses of logic when composing a scientific argument. Lack of creativity or original thinking.		
Gain the competitive skills required to be successful in identifying scientific research topics and acquiring necessary resources.	Demonstrates a thorough understanding of the scientific method, clear ability to understand and design complex experimental protocols	Demonstrates good understanding of scientific method, designs experiments appropriate for addressing hypotheses	Demonstrates satisfactory understanding of scientific method and appropriate experimental designs	Demonstrates minimal understanding of scientific method, limited ability to conceive of experimental design to address hypotheses		
Competently communicate technical topics to a variety of audiences through proper selection and use of appropriate media and techniques.	Articulates intimate understanding of the topic, is able to orally communicate and defend new ideas, thinks effectively on his/her feet, is able to integrate knowledge from multiple disciplines and experience in solving problems.	Has appropriate understanding of the topic, able to articulate ideas but lacks some creativity, can think through basic problems when questioned, has an adequate knowledge base and is able to integrate appropriately to solving problems.	Has a basic understanding of the topic but lacks depth, can answer basic questions about the topic but has some difficulty thinking on his/her feet, has some gaps in knowledge base and does not effectively use this for problem solving.	Lacks understanding of the topic and unable to communicate rationale for interpretation of data or direction of the topic, substantial gaps in knowledge base and is unable to draw from different areas or experiences to solve problems.		

BAE Doctor of Philosophy Final Exam Rubric

Student:
Date of Exam:
Exam Committee Members:

Learning outcomes	Excellent 4	Competent 3	Marginal 2	Deficient 1	Insufficient data to assess 0	SCORE
Combine formal coursework with independent study to achieve subject matter mastery within their selected field of specialization.	Demonstrates a thorough knowledge of the supporting technical topics, work advances the state of the art and suitable for peer-reviewed publication.	Demonstrates familiarity with underlying technical foundations of the topic, work is consistent in quality and contribution to recently published studies	Demonstrates awareness of some of the technical foundations, contribution extends only slightly beyond textbook knowledge.	Major deficiencies in understanding of the technical background of the topic, key concepts are missing or incorrectly applied.		
Gain the competitive skills required to be successful in identifying scientific research topics and acquiring necessary resources..	Student played a leading role in identifying the research topic, secured a major portion of the required funds to conduct the research from an external agency.	Student played a major role in identifying the research topic, sought external funding to conduct the research.	Major guidance was required in identification of a research topic, student did not meaningfully seek external funding for research support.	Encountered major difficulty in identifying a research topic, no external funding sought or received.		
Learn to independently manage personnel, resources, activities and time to accomplish research objectives.	All activities occurred in timely fashion, exercised independence in managing required personnel and resources, all stated objectives fulfilled.	All objectivities substantially fulfilled in timely fashion, largely independent management of personnel and resources.	Objectives fulfilled to acceptable degree with some schedule slippage, guidance and assistance required to manage personnel and resources.	Research objectives marginally accomplished with schedule slippage and major support required to manage personnel and resources.		
Understand the peer-reviewed publication process and successfully use it to disseminate research findings.	Two or more manuscripts submitted during program and accepted for publication.	One manuscript submitted during program and accepted for publication.	At least one manuscript submitted for publication with a high likelihood of acceptance.	No manuscripts submitted for publication, dissertation does not easily lend itself to adaptation as a publishable manuscript.		
Competently communicate technical topics to a variety of audiences through proper selection and use of appropriate media and techniques.	Articulates intimate understanding of the project, is able to orally communicate and defend new ideas, thinks effectively on his/her feet, is able to integrate knowledge from multiple disciplines and experience in solving problems.	Has appropriate understanding of the project, able to articulate ideas but lacks some creativity, can think through basic problems when questioned, has an adequate knowledge base and is able to integrate appropriately to solving problems.	Has a basic understanding of the project but lacks depth, can answer basic questions about the project but has some difficulty thinking on his/her feet, has some gaps in knowledge base and does not effectively use this for problem solving.	Lacks understanding of the project and unable to communicate rationale for interpretation of data or direction of the project, substantial gaps in knowledge base and is unable to draw from different areas or experiences to solve problems.		

ANNUAL SLO ASSESSMENT REPORT 2015-2016
Office of University Assessment
University of Kentucky

College: COLLEGE OF ENGINEERING
Department: Biosystems and Agricultural Engineering
Degree: PhD

Student Learning Outcome (SLO)
State the Student Learning Outcome (SLO). It should be clear, measurable, and directly related to student learning. It should be related to students' performance of knowledge, skills, and abilities, such as papers, projects, or presentations. It should not be related to operational objectives, such as graduation/retention rates or GPAs.
#5 Competently communicate technical topics to a variety of audiences through proper selection and use of appropriate media and techniques.
Rationale for use of assessment tool and how tool aligns to the Student Learning Outcome
Provide a clear description of the assessment tool/activity/method that was used for this assessment cycle. If there is more than one tool/activity/method, describe each one. If a licensing or certification exam is used, a rationale is provided as to why this exam was selected and how it aligns to the student learning outcome.
Grade in BAE 775 Professional Seminar Spring Semester Section. Learning outcomes of this course include:

- Deliver an oral scientific presentation to include supporting visual aids.
- Present scientific studies using poster format.
- Communicate scientific information using adult outreach methods.
- Communicate technical information to non-technical audiences.
- Demonstrate familiarity with university-level instructional techniques.

Seminar Evaluation Rubric. Each seminar is evaluated using a standard rubric.
Is your program primarily using direct methods (i.e., rubrics, exams, papers, projects, presentations) or indirect methods (i.e., grades, GPA, course pass rates, etc.)?
Direct method in the seminar rubric and indirect grades in the Professional Seminar class
Explain why the assessment tool/activity/method is appropriate for measuring student learning for the stated outcome.
Students in BAE 775 prepare an oral presentation, a poster presentation, an outreach product presentation (extension type bulletin) and a technical class lecture. This accounts for 45% of the grade in the class.
The seminar evaluation rubric measures the student's ability to communicate in a real-world situation.
Did you use any other methods to ensure the validity and reliability of your results and/or findings (e.g., multiple data sources, validation of the tool)?
No.
Benchmark/Target/Goal
Provide the benchmark/target/goal for the assessed student learning outcome. Be specific and explain how the benchmark/target/goal was determined.
Based upon discussion among the faculty, the target was for the students to achieve at least a 3.5 in the class and 3.5/5.0 on the seminar evaluation.
Data Collection (includes time/semester and place, sampling process, population description, and data review process)

Provide a complete explanation of each data collection process and protocol so the reviewer fully understands the data collection methodology.
The percentage of the grade in the class assigned to each topic is: Oral presentation (15%), Poster presentation (10%), Outreach product presentation (10%) and technical lecture (10%). The grades are assigned by the instructor.
Each seminar is evaluated during the seminar using the attached rubric.
Did you use any processes to ensure the quality of the data (e.g., two or more reviewers, or a different, secondary validation method, Cronbach's alpha)?
Each seminar is evaluated by three individuals.
If you used a rubric or scoring guide, is it appended to this report?
Yes.

Results

Please present your assessment results below. Results should be specific and disaggregated in a visual representation (charts and graphs) that is easily understood by an external reviewer. For example, if a rubric was used to assess the student work, break down the results by each achievement category and performance criterion. If a licensing or certification exam is used, the results are disaggregated. For example, the results are broken down by demographics, content areas, or sections. Pass rates should not be the only results provided.
Eight PhD students have been enrolled in BAE 775 (Professional Practices Seminar – Spring semester) during the last three years and they all earned an "A" grade.
The average score on the seminar rubric was 4.32/5.0. (Need to insert bar graph here.)

Interpretation of Results

Which people/committees/groups participated in the interpretation of the results? How were these results communicated to faculty and/or stakeholders?
The faculty member teaching this class initiated this SLO and has geared the class instruction emphasize this material and the evaluation to address the students' performance. The class was reviewed during a recent faculty retreat and the faculty decided that each graduate student should take the course.
The seminar evaluations are given to the student and summarized by the DGS.
Please explain the results. Include things like:

a. Your program's level of satisfaction with the results
b. An explanation of how the past/current curriculum/co-curriculum might have impacted the results

The faculty decided that each graduate student should take the class.
What are the limitations of this assessment research and/or findings?
The class is evaluated by the faculty member only.
The seminars are evaluated by different individuals each time. Therefore there could be significant differences in the expectations of the individuals scoring the rubric.
Were multiple years of data used to help interpret the results? If so, are then any trends, consistencies, or inconsistencies? If so, please report.
Three years of data are included in this report. However due to the limited number of students any trends or inconsistencies in the data are not able to be determined.
Did you meet your anticipated benchmark/target/goal? Why or why not?
The target was exceeded in both the class scores and the seminar evaluations.

Reflection of Results and Assessment Process

How do the reported results and/or findings effect your improvement actions?
We will continue to emphasize the presentations made in the class and their seminar.
Reflect on your assessment process and results. Do you think these results are valid and/or reliable?
The small number of students (and thus sample size) make interpretation of these results and draw conclusions and/or inferences difficult.
Are the results sufficient to make informed decisions to improve student learning? Why or why not?
The small number of students (and thus sample size) make interpretation of these results and draw conclusions and/or inferences difficult.
Do you plan to make changes to assessment or data collection process(es)?

The assessment tools and data collection processes for all the SLOs will be evaluated by the BAE Graduate Committee during this academic year.

Actions Intended for the Improvement of Student Learning

Provide a discussion of your intended improvement actions that focus specifically on student learning. Explain why or how the improvement action is expected to positively affect the learning outcome.

Additional emphasis on this topic will be included in the Seminar class. The seminar evaluations will be shared with the student's advisor and they will be encouraged to discuss the results with the student and give them guidance on making improvements.

Discuss any causation or associated details identified in your assessment activities (e.g., approximate dates of and person(s) responsible for implementation, and where in curriculum/activities and department/program they will occur; how results and intended improvement actions will impact SLO).

The results of this evaluation will be discussed in a faculty meeting within the next six months.

If applicable, provide a discussion of any empirical or research based evidence that supports your intended improvement actions.

Noe are known at this time.

Additional Insights or Reflection [This section is not scored]

Are there any insights you would share regarding your assessment efforts?

The seminar rubric is effective in being able to get the input from a variety of individuals with different levels of knowledge of the subject being presented. However there appears to be considerable variation in expectations in evaluating the same individual. Additionally the evaluators are different between seminars and therefore additional variations are introduced.

If you have additional notes regarding your assessment efforts that should be considered in future reflections of this work, please include them below.

No response.

Is there any other work being done in the program that may not be directly related to the learning outcome that you would like to share? If so, please provide that information below.

No response.

APPENDIX: Seminar Evaluation Rubric

Speaker Style	Poor Acceptable Excellent <----------Rating---------->				
Presented a professional appearance.	1	2	3	4	5
Good voice volume, pitch and inflection; clear articulation, appropriate rate of delivery.	1	2	3	4	5
Maintained eye contact with audience, good use of body language and non-verbal communication.	1	2	3	4	5
Demonstrated enthusiasm for the topic.	1	2	3	4	5
Used appropriate vocabulary, no jargon, good choices of words/phrases.	1	2	3	4	5
Adhered to time limit.	1	2	3	4	5

Presentation Content					
Introduced him/herself and their relationship to the topic.	1	2	3	4	5
Introduced the presentation with a clearly-stated purpose and review.	1	2	3	4	5
Provided the background necessary to understand the need for the work.	1	2	3	4	5
Expressed the main ideas clearly and logically.	1	2	3	4	5
Used appropriate information to demonstrate and support main points.	1	2	3	4	5
Technical level was appropriate to the topic and to the audience.	1	2	3	4	5
Organization was easy to follow.	1	2	3	4	5
Stated conclusions/recommendations follow reasonably from the presentation.	1	2	3	4	5
Concluded with a concise, thorough summary of the presentation.	1	2	3	4	5

Visual Aids					
Did not read directly from visual aids.	1	2	3	4	5
Visual aids were without errors.	1	2	3	4	5
Visual aids were relevant to and supported main points.	1	2	3	4	5
Used visual themes (colors, fonts, sizes) that were easily readable.	1	2	3	4	5
Visual aids were clear, uncluttered and free from distractions.	1	2	3	4	5

Student Learning Outcome (SLO)
State the Student Learning Outcome (SLO). It should be clear, measurable, and directly related to student learning. It should be related to students' performance of knowledge, skills, and abilities, such as papers, projects, or presentations. It should not be related to operational objectives, such as graduation/retention rates or GPAs.
#4 Understand the peer-reviewed publication process and successfully use it to disseminate research findings.
Rationale for use of assessment tool and how tool aligns to the Student Learning Outcome
Provide a clear description of the assessment tool/activity/method that was used for this assessment cycle. If there is more than one tool/activity/method, describe each one. If a licensing or certification exam is used, a rationale is provided as to why this exam was selected and how it aligns to the student learning outcome.

a) BAE 775 Grades - Professional Practices Seminar (Spring Section) (The spring semester includes sections on review of research methods, management tools and communication techniques.)
b) Peer-Reviewed Publications – The Department provides a $250 award for each paper submitted to a peer-reviewed journal.

Is your program primarily using direct methods (i.e., rubrics, exams, papers, projects, presentations) or indirect methods (i.e., grades, GPA, course pass rates, etc.)?
The first tool uses an indirect method and the second tool uses a direct method
Explain why the assessment tool/activity/method is appropriate for measuring student learning for the stated outcome.
The Professional Practices Seminar has class sessions on writing peer reviewed research papers and discuss the processes involved in producing a peer-reviewed publication.
Each student is encouraged to produce a peer-reviewed publication. They learn about the process by being responsible for submitting and taking their paper through the process.
Did you use any other methods to ensure the validity and reliability of your results and/or findings (e.g., multiple data sources, validation of the tool)?
No
Benchmark/Target/Goal
Provide the benchmark/target/goal for the assessed student learning outcome. Be specific and explain how the benchmark/target/goal was determined.
The target is for the students to average 3.5/4.0 grades on the Professional Practices seminar and to average two peer-reviewed publications per student during their program.
Data Collection (includes time/semester and place, sampling process, population description, and data review process)
Provide a complete explanation of each data collection process and protocol so the reviewer fully understands the data collection methodology.
Grades for the class were reported each semester.
Publications were reported by the student's major professor, reviewed by the BAE Graduate Committee, and reported on the Final Exam Rubric.
Did you use any processes to ensure the quality of the data (e.g., two or more reviewers, or a different, secondary validation method, Cronbach's alpha)?
The papers being submitted for peer-review publication are reviewed by the BAE Graduate Committee before they are awarded the $250 paper submittal award by the department.
If you used a rubric or scoring guide, is it appended to this report?
Yes
Results
Please present your assessment results below. Results should be specific and disaggregated in a visual representation (charts and graphs) that is easily understood by an external reviewer. For example, if a rubric was used to assess the student work, break down the results by each achievement category and performance criterion. If a licensing or certification exam is used, the results are disaggregated. For example, the results are broken down by demographics, content areas, or sections. Pass rates should not be the only results provided.

Eight PhD students have been enrolled in BAE 775 (Professional Practices Seminar – Spring semester) during the last three years and they all earned an "A" grade.
There were 24 $250 awards for refereed journal articles published since 2011.

Interpretation of Results

Which people/committees/groups participated in the interpretation of the results? How were these results communicated to faculty and/or stakeholders?
The faculty member teaching the Professional Practices Seminar initiated this SLO and has included material in the class to address this issue. Grading of the papers prepared is done considering the purpose of this SLO.
The papers being submitted are reviewed by the Graduate Committee and titles of papers published are included in the agenda of each monthly faculty meeting.
Please explain the results. Include things like:

a. Your program's level of satisfaction with the results
b. An explanation of how the past/current curriculum/co-curriculum might have impacted the results

The class was discussed and evaluated at a recent faculty retreat. It was concluded that it should be taken by each of the graduate students.
The exam rubric is reviewed on an annual basis.
The department initiated giving awards to the graduate students for submittal of papers to peer-reviewed journals. We have determined anecdotally that this has been an incentive for some of the students to prepare a paper.
What are the limitations of this assessment research and/or findings?
There is insufficient data due to the limited number of students.
Were multiple years of data used to help interpret the results? If so, are then any trends, consistencies, or inconsistencies? If so, please report.
Three years of data are included in this report. However due to the limited number of students any trends or inconsistencies in the data are not able to be determined.
Did you meet your anticipated benchmark/target/goal? Why or why not?
We met our goal for the grade in the Professional Practices Seminar. We did not meet our goal of two peer-reviewed publications per student. Students are understanding the publication process but it is very difficult to get them to produce peer-reviewed publications once they have finished their thesis.

Reflection of Results and Assessment Process

How do the reported results and/or findings effect your improvement actions?
It appears as though the giving of awards for preparation of papers has been beneficial and thus this program will continue.
Reflect on your assessment process and results. Do you think these results are valid and/or reliable?
The small number of students (and thus sample size) make interpretation of these results and draw conclusions and/or inferences difficult.
Are the results sufficient to make informed decisions to improve student learning? Why or why not?
The small number of students (and thus sample size) make interpretation of these results and draw conclusions and/or inferences difficult.

Do you plan to make changes to assessment or data collection process(es)?
The assessment tools and data collection processes for all the SLOs will be evaluated by the BAE Graduate Committee during this academic year.

Actions Intended for the Improvement of Student Learning

Provide a discussion of your intended improvement actions that focus specifically on student learning. Explain why or how the improvement action is expected to positively affect the learning outcome.
Students are encouraged (and financially supported) to attend ASABE Society Meetings. Many of the students will present a paper or poster at these meetings. They will be encouraged to expand these presentations to peer-review publication quality and subsequently submit them. The ethical issues of plagiarism continue to be emphasized in the class.

Discuss any causation or associated details identified in your assessment activities (e.g., approximate dates of and person(s) responsible for implementation, and where in curriculum/activities and department/program they will occur; how results and intended improvement actions will impact SLO).
This will be a topic of a faculty meeting within the next six months.
The faculty member teaching the Professional Practices Seminar initiated this SLO and has included material in the class to address this issue. Grading of the papers prepared is done considering the purpose of this SLO.
Each student is supposed to present a seminar on their project during the first year they are in the program. The students will be encouraged to expand these presentations into publishable material.
If applicable, provide a discussion of any empirical or research based evidence that supports your intended improvement actions.
None are know at this time.
Additional Insights or Reflection [This section is not scored]
Are there any insights you would share regarding your assessment efforts?
With the expansion of the number of peer-reviewed electronic publications the variation in the quality of these publications is becoming more important. Discussion of this needs to be included in the class presentations.
There are several other methods of disseminating research findings in addition to peer-reviewed publications.
If you have additional notes regarding your assessment efforts that should be considered in future reflections of this work, please include them below.
No response.
Is there any other work being done in the program that may not be directly related to the learning outcome that you would like to share? If so, please provide that information below.
No response.

APPENDIX: PhD Final Exam Rubric

Learning outcomes	Excellent 4	Competent 3	Marginal 2	Deficient 1	Unable to Assess 0	SCORE
Understand the peer-reviewed publication process and successfully use it to disseminate research findings.	Two or more manuscripts accepted for publication during program.	One manuscript accepted for publication during program.	At least one manuscript submitted for publication with a high likelihood of acceptance.	No manuscripts submitted for publication.		

UNIVERSITY OF KENTUCKY
College of Engineering
Annual Student Learning Outcomes Assessment Report
Academic Year: 2014-2015

Department: _____BAE_____ Program: _____BAE_____ Degree: _____PhD_____

Prepared by: __Donald Colliver_____ Phone Number: __859-218-4348_____

(Please complete one table for each outcome you are assessing following the "SLO Assessment Report Rubric" rev May 2015)

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #/ltr: SLO ID #2: Gain the competitive skills required to be successful in identifying scientific research topics and acquiring necessary resources.	**ASSESSMENT METHODS & TOOLS:** a. BAE 775 Grades b. Qualifying Exam rubric c. Final Exam Rubric Benchmark/Target: a. 3.50 average in BAE 775 b. 3.50 average on Qualifying Exam rubric c. 3.50 average on Final Exam Rubric	a. BAE 775, which was introduced as part of this process. It has been taught each fall and spring semester since the fall of 2012 with an average attendance of 8.5 MS and PhD students. Each PhD student that took the course earned a grade of 4.0. b. Ph.D. Qualifying Exam results – Unfortunately there have been insufficient students taking their qualifying exam since the QE rubric was developed to yield significant results. c. Ph.D. Final Exam	c. From evaluation of the students' grades in the class it appears as though the students have gotten a basic understanding of identifying good scientific researchable topics. d. There were not enough data to provide results to be analyzed. We have several PhD students who will be taking their QE in the next year. The results on this topic will be evaluated and modifications will be made upon evaluation of that feedback.	a. We will continue to teach BAE 775 in the fall and spring semesters. Since there was little scatter in the scores, a better recording of the individual components of the class will give guidance on what part of the class needs improvement. In addition we will continue to collect data on graduating students and compare between-year data to determine whether the course material is producing improvements in this outcome. The faculty will discuss the evaluation metrics given in the	**The "Reflection" column should not be populated at this time – programs will need a few months to reflect on their actions before completing this field.**

		results - A question asking if the student has achieved this learning outcome is posed on the PhD Exam Assessment. Average score from the Final Exam Assessments of this outcome is currently 3.24 (SD=0.59, n=7).	e. Results as analyzed by the DGS indicate not meeting the target. Since there were no scores for the last evaluation period it is difficult to determine if significant improvement is being made in this area. It was noted that the there was a large SD in the responses to this question. Three students received very high scores on this question whereas three of the students received scores low scores. It was recognized that these three students took longer to complete their studies – thus reflecting on the lower score.	assessment tool to identify modifications in the training process and/or revision of the metrics. b. The DGS will review and revise the Qualifying Exam rubric to verify that it adequately evaluates this SLO. c. It will be recommended to the student's major professor that the evaluation learning outcome assessment criteria be discussed before the exam. In an attempt to evaluate if there might be are biases or inconsistencies in scoring, the names of the evaluators will be tracked on the assessment forms and comparisons in scores will be made between the Qualifying and the Final Exams. Greater emphasis will be put on completing the degree in a timely manner.	

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #/ltr: SLO ID #3: Learn to independently manage personnel, resources, activities and time to accomplish research objectives.	**ASSESSMENT METHODS & TOOLS:** a. Grades in BAE 775, Professional Practices Seminar, Research Principles Exam. b. Final PhD Exam Assessment **TARGET / BENCHMARK:** a. 3.50 average in BAE 775 b. 3.50 average on Final Exam Rubric	a. BAE 775, which was introduced as part of this process. It has been taught each fall and spring semester since the fall of 2012 with an average attendance of 8.5 MS and PhD students. Each PhD student that took the course earned a grade of 4.0. b. A question asking if the student has achieved this learning outcome is posed on the PhD Exam Assessment. Average score from the Final Exam Assessments of this outcome is currently 3.52 (SD=0.50, n=7).	a. From evaluation of the students' grades in the class it appears as though the students have gotten a basic understanding of these principles. b. Results as analyzed by the DGS indicate meeting the target. Since there were no scores for the last evaluation period it is difficult to determine if significant improvement is being made in this area. It was noted that the student that received the lowest average score on the evaluation also had the largest number of external committee members who had not used the evaluation form before. One observation indicated that there was some time	a. We will continue to teach BAE 775 in the fall and spring semesters. Since there was little scatter in the scores, a better recording of the individual components of the class will give guidance on what part of the class needs improvement. b. Continue collecting data on graduating students and compare between-year data to determine whether the course material is producing improvements in this outcome. The faculty will discuss the evaluation metrics given in the assessment tool to identify modifications in the training process and/or revision of the metrics. It will be recommended to the student's major professor that the evaluation learning outcome assessment criteria be discussed before the exam.	**The "Reflection" column should not be populated at this time – programs will need a few months to reflect on their actions before completing this field.**

			management issues in that the projects took longer than anticipated and thus this item was not scored as "excellent" or 4.0.	In an attempt to evaluate if there might be are biases or inconsistencies in scoring, the names of the evaluators will be tracked on the assessment forms.	

UNIVERSITY OF KENTUCKY
College of Engineering
Annual Student Learning Outcomes Assessment Report
Academic Year: 2013-2014

Department: Biosystems and Agricultural Engineering Program: BAE Degree: PhD

Prepared by: Don Colliver Phone Number: 859-218-4348

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #: 1 Combine formal coursework with independent study to achieve subject matter mastery within their selected field of specialization.	**ASSESSMENT METHODS & TOOLS:** i. Specialized plan of study. ii. Course grades iii. Final Exam rubric **TARGET / BENCHMARK:** i. Appropriate specialization. ii. 3.50 GPA on plan of study. iii. 3.50 average on Final Exam rubric.	i. PhD Plans of Study: the PhD plan of study is individualized for each student with special problem courses utilized if needed for particular areas of specialization. The Plan of Study is approved by the student's entire committee. ii. Course grades: the average cumulative graduate GPA is 3.719 (range 3.0-4.0) iii. PhD Final Exam results – Unfortunately no rubric data were obtained from the exams	Plans of study indicate appropriate specialization. Initial data indicate target GPA is being exceeded. Data on Final Exam rubrics are limited	Data are insufficient to justify improvement actions. Data collection and analysis will continue. Methods are being put in place to assure data are captured.	

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #: 5 Competently communicate technical topics to a variety of audiences through proper selection and use of appropriate media and techniques.	**ASSESSMENT METHODS & TOOLS:** i. Oral presentation rubric ii. Final Exam Rubric iii. Presented conference papers/posters. **TARGET / BENCHMARK:** i. Average of 3.5 on oral presentation rubric ii. 3.50 average on Final Exam Rubric iii. Average of 2.0 conference papers/posters per student during their program.	i. Oral presentation results: one PhD seminar was presented which was evaluated and it received 4.48/5.0 from three reviewers ii. Final exam results – unfortunately no rubric data were obtained from the PhD exams iii. Three conference papers were presented and six referred papers were published.	Data on BAE 775 (oral presentation) are limited. Final Exam data are very limited. Initial data indicate that, on average, conference presentation/poster goals are being met or exceeded.	Data are insufficient to justify improvement actions. Data collection and analysis will continue, and tools are available to capture conference presentation/poster data.	

IMPROVEMENT ACTION PLANS

Academic Year: 2012-2013

Department: _Biosystems & Ag Engineering_____ Program: ___Biosystems Engineering_____ Degree: _____PhD_____

Prepared by: __Don Colliver_____, Phone Number: ___7-3000x211_____

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #: 4 Understand the peer-reviewed publication process and successfully use it to disseminate research findings.	**ASSESSMENT METHODS & TOOLS:** i. BAE 775 Grades ii. Peer-Reviewed publications **TARGET / BENCHMARK:** i. 3.50 of 4.00 average in BAE 775 ii. Average of two peer-reviewed publications per student during their program.	4 PhD students were enrolled in BAE 775 (Professional Practices Seminar) in the fall of 2012 and they all earned an "A" grade. There were 5 refereed journal articles published in 2012.	Students are understanding the publication process but it is difficult to get them to produce peer-reviewed publications once they have finished their thesis.	We have initiated a financial reward for students when they get a paper accepted for publication. There have been initial discussions in faculty meetings about requiring a peer-reviewed paper for graduation.	

STUDENT LEARNING OUTCOME ASSESSED	METHODS Includes 2 components: (1) Assessment Methods & Tools AND (2) Target / Benchmark	RESULTS	INTERPRETATION OF RESULTS	IMPROVEMENT ACTION	REFLECTION
Outcome #: 5 Competently communicate technical topics to a variety of audiences through proper selection and use of appropriate media and techniques.	**ASSESSMENT METHODS & TOOLS:** i. Oral presentation rubric developed by DGS and approved by departmental Graduate Committee, completed by selected audience faculty and collected by DGS. ii. Final Exam Rubric developed by DGS and approved by departmental Graduate Committee, completed by advisory committee and collected by DGS iii. Presented conference papers/posters. **TARGET / BENCHMARK:** i. Average of 3.5 of 4.0 on oral presentation rubric ii. 3.50 average of 4.0 on Final Exam Rubric iii. Average of 2.0 conference papers/posters per student during their program.	Unfortunately the information collected to evaluate i. was lost due to the departure of the staff assistant handling this information and the transition to a new DGS. The average score on this item on the Final Exam Rubic was 3.33. There were 4 conference papers/posters presented.	Data on this outcome are lacking – both in the oral presentation rubric due to loss of information and the small number of data points from the Final Exam Rubric.	Additional work and emphasis is needed on this learning outcome. A tracking mechanism will be set up to assure that every PhD student will have to present two seminars. Have students get more practice by getting them to assist their major professor in developing the professors posters. Consider expanding the financial reward program to also include conference papers or posters.	

Improvement Actions Plans for academic year 2011-2012 (Due May 11, 2012)

Department: BAE *Program: BAE* *Degree: Doctor of Philosophy*

Prepared by: Dwayne R. Edwards *Phone Number: (859) 257-3000, ext. 109*

(Please fill in one table for each outcome you are assessing.)

Student Learning Outcome(s)	Methods	Results (Evidence/Data)	Analysis	Improvement Action
Outcome #2 Gain the competitive skills required to be successful in identifying scientific research topics and acquiring necessary resources.	Assessment Tools: a. Grades in BAE 775, Professional Practices Seminar, Preparation of Research Proposals Exam. b. Final PhD Exam Assessment Benchmark/Target: a. Average grade of at least 90%. b. Average rating of at least 3.0 on applicable Assessment items.	a. BAE 775, which was introduced as part of this process, is scheduled to be taught for the first time in Fall 2012. No data are presently available regarding this assessment tool. b. Average score from the Final PhD Exam Assessments of this outcome is currently 3.1 (for two students).	a. Not applicable; results will be available and analyzed during the Fall 2012 semester. b. Results as supplied by the students' advisory committees and analyzed by the DGS are roughly equal to the target, and this is prior to their formal presentation with the relevant material from BAE 775. If, as expected, scores improve, an upward revision of the target might be merited.	a. We will teach BAE 775 as scheduled in Fall, 2012. The syllabus is complete as are the majority of materials for this portion of the course, which is specifically targeted toward building/improving students' skills in this outcome area. b. Continue collecting data on graduating students and compare data before/after initiation of BAE 775 to determine whether the course material is producing improvements in this outcome. The faculty will meet in Summer 2013 to identify modifications in the training process and/or revision of the target.

Student Learning Outcome(s)	Methods	Results (Evidence/Data)	Analysis	Improvement Action
Outcome #3 Learn to independently manage personnel, resources, activities and time to accomplish research objectives.	Assessment Tools: a. Grades in BAE 775, Professional Practices Seminar, Research Principles Exam. b. Final PhD Exam Assessment Benchmark/Target: a. Average grade of at least 90%. b. Average rating of at least 3.0 on applicable Assessment items.	a. BAE 775, which was introduced as part of this process, is scheduled to be taught for the first time in Fall 2012. No data are presently available regarding this assessment tool. b. Average score from the Final MS Exam Assessments of this outcome is currently 3.3 (for two students).	a. Not applicable; results will be available and analyzed during the Fall 2012 semester. b. Results as supplied by the students' advisory committees and analyzed by the DGS currently exceed the target, and this is prior to their formal presentation with the relevant material from BAE 775. If, as expected, scores improve, an upward revision of the target might be merited.	a. We will teach BAE 775 as scheduled in Fall, 2012. The syllabus is complete as are the majority of materials for this portion of the course. b. Continue collecting data on graduating students and compare data before/after initiation of BAE 775 to determine whether the course material is producing improvements in this outcome. The faculty will meet in Summer 2013 to identify modifications in the training process and/or revision of the target.

Appendix F – Implementation Reports Since Last Review

Implementation Plan Report
Biosystems and Agricultural Engineering
University of Kentucky
Update 2016 – 2017

1. Devise a plan to support machine systems automation engineering in the long run.
Assessment method: The number of machine systems technical elective courses available to our machinery students, and the number of machinery students in those courses.
Results:

Academic Year	BAE 417	BAE 515 Fluid Power	BAE 599 Component Design	BAE 599 Control of Off-Road Vehicles	Total (by year)
12-13 F	4	-	-	-	4
12-13 S	-	-	-	-	
13-14 F	20	-	-	-	31
13-14 S	-	4	7	-	
14-15 F	32	7	-	-	54
14-15 S	-	-	-	15	
15-16 F	29	10	-	-	48
15-16 S	-	-	9	-	
16-17 F	13	-	-	-	20
16-17 S	-	-	-	7	
17-18 F	31	12	-	-	

Analysis of results and reflection: The number of students in our machinery classes grew exponentially when we hired our two new machinery professors (2012, 2013). There was a slight dip in the 2016-2017 academic year, but 43 students are enrolled in machinery classes during Fall 2018 and BAE 599 Component Design will be offered in Spring 2018.

Ongoing improvement actions: We will continue to support this area with teaching resources.

2. Determine future department direction based on current areas with strong faculty support and identify areas that need more support.
Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. In August of 2015 we held a two day faculty retreat to discuss future faculty hiring decisions based on teaching, research, and extension needs.
Results: We held a faculty retreat again in the Summer 2015 where we discussed future departmental direction. BAE may have up to 5 retirements in the next 5 years, and replacing these faculty members provides an opportunity to redirect our department if desired. As a faculty we agreed to recruit a new assistant professor to teach BAE 427, and this position was filled in July, 2016. The course has been taught by one of Dr. Colliver's PhD students who works in industry in the Controlled Environment area, and the students are very complimentary of his

knowledge and teaching ability, and Christian Tabor will teach the course again this year while Dr. Hayes sits in and prepares to teach the course herself in Spring, 2018.

Analysis of results and reflection: The discussion we had within the department was a healthy one, and one that was necessary. Not only did we solve our immediate concern regarding offering the BAE 427 course, but we have chosen to rededicate ourselves to livestock system engineering, hiring 3 faculty in that area this past year (Joshua Jackson, Morgan Hayes, and Mick Peterson) and one in the bioenvironmental area (William Ford III).

Ongoing improvement actions: We developed a long-term hiring plan to focus on fewer areas but with more depth in each area. This discussion is on-going and we have had one faculty member fully retire and have two in phased retirement. We require additional planning for future faculty hires.

3. Publications or building plans that still have some value should be considered for revision if faculty, with expertise in the area, are still an active part of the department. Original authors should be a consideration for making a revision, if available. Web links should be reviewed so that the number of broken links to internal publications and plans are resolved.

Assessment method: This recommendation was accepted by external review committee recommendation. In February, 2013, we hired an Extension Associate Senior, Karin Pekarchik, to coordinate this effort. In 2015-2016 the extension faculty worked with Dr. Tanya Dvorak to reinvigorate our extension programs by defining objectives, goals, and performing situational analyses.

Results: In past years we moved the older publications and plans to the archive, and a warranty disclaimer was added to each individual plan or publication. The warranty disclaimer is found both on the webpage and then on the first page of the PDF, in instances where there is an attachment that can be downloaded. The archive can be found at https://www.uky.edu/bae/extension-programs. Karin has initiated an overhaul of our extension webpages based on the discussions the departmental extension faculty. Individual faculty members are initiating plans to rewrite some of the older, but still relevant, publications.

Analysis of results and reflection: Much care was taken in crafting the warranty disclaimer to ensure that the public would understand that these archived items are conceptual plans only. Every effort has been made to ensure that the warranty disclaimer is prominent and, even if the plan or publication is downloaded, that it remains with the publication/plan as the first page of the document.

Ongoing improvement actions: The entire website has been redone. There are numerous plans and publications that need to be updated or archived. When they are moved to the archive, the warranty disclaimer is added. We are working on a plan on how to update relevant publications.

4. Lab facilities are an asset to the department, and a mechanism should be adopted for better coordination of labs and equipment.

Assessment method: This recommendation was accepted by external review committee recommendation. This topic was brought to the faculty in 2013. This item is assessed by monitoring faculty member's ability to conduct their projects in the space assigned to them.
Results: We improved the coordination of laboratory equipment use by creating two lab manger positions who oversee these issues. Consequently labs are being better utilized. We have designated some of our underutilized labs to be shared-use facilities so that projects which need more space intermittently will have room to expand temporarily. We also use the shared-use lab for teaching because, with our increased enrollment, we need additional space for student laboratories.
Analysis of results and reflection: The situation has improved, however we continue to work on freeing up space for new activities. Being an engineering department, our faculty members build equipment, and the timely disposal of these innovations is a continual challenge.
Ongoing improvement actions: Our two facilities supervisors work with members in BAE to identify and discard items that are no longer in use. We have instituted a yearly "dumpster day" to encourage the entire department to clean their labs. This has worked well. The facilities managers are working on repairing valuable equipment, sending excess equipment to surplus, and upgrading obsolete/non-functioning equipment. The storage barn at North Farm was destroyed in a windstorm and we are working on replacing it.

5. Growth areas in general should be evaluated to determine the level of support and specialty courses needed to accommodate students.
Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. During the summer of 2013 we determined, as a department, what our ideal enrollment growth would be. This was followed by (SU/FA 2013) the development of a recruitment plan to encourage students to major in under-populated specializations.
Results: We continue to have lower enrollment in our Controlled Environment and our Food Engineering area, however we are seeing signs of increased interest in both of these areas.
Analysis of results and reflection: This is the second year we have seen freshman interested in Controlled Environment and Food Engineering, so we believe we are on the right track. Three of our four new faculty this year work in the area of controlled environment, so we believe additional students will be attracted to this specialization.
Ongoing improvement actions: The switch to the common first year engineering program has changed the first two years of our undergraduate students education. We are still unsure how that change will impact our entire program. Dr. Crofcheck has been active with the Beer, Wine, and Distilling Certificate and Dr. Agouridis with Stream and Watershed Certificate.

6. The department should help students to develop ways to market themselves by using more recognizable terms for résumés and other forms of communication with prospective employers.
Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. In the summer of 2013, we devised a

simple, clear, consistent message regarding our department and we display this message on the web page and educate our students to promote themselves in this manner.
Results: Both BAE 200 and BAE 400 have incorporated "BAE elevator speeches" into their courses, so we are beginning earlier to encourage the students to develop their marketing message and then reinforcing this again in their senior year.
Analysis of results and reflection: BAE is a fairly unique major, especially within Engineering because there is only one program of BAE per state. BAE departments are associated with the Land Grant system only. Another challenge is that BAE keeps reinventing the profession to attract more students, which is working, but our marketing message keeps changing. Considerable effort has been made to promote the department in a consistent way to as many arenas as possible. Our goal is to educate our students to market themselves clearly and accurately.
Ongoing improvement actions: We continue to work with the students. We continue to improve our marketing description on our web page, and use that description consistently in all our recruitment materials.

7. Extension specialists need to explore current options for program delivery that could reduce unnecessary travel and that would accommodate teaching schedules.
Assessment method: This recommendation was accepted by external review committee recommendation. On February 11, 2013, we hired an Extension Associate Senior, Karin Pekarchik, to assist with distance learning and web delivery pedagogy and technology.
Results: During our faculty search and interview process for the livestock systems engineering position, the department utilized skype and virtual meetings frequently to connect with county extension agents and receive input.
Analysis of results and reflection: The use of lync/skype technology was very successful. We have several agents attend the interviews and provide feedback regarding our interview candidates.
Ongoing improvement actions: As we work toward reinvigorating our extension programs, we continue to think of creative ways to reach our extension clientele. We have two new extension specialists in the area of livestock systems engineering who are working on alternative means for distributing information (YouTube). We are still evaluating how to make the videos and promote them.

8. The department needs to strongly encourage publication as a visible way of documenting activity. The department should send a consistent message to graduate students regarding publication of their work and explore a publishing incentive program like that used by the UK Entomology Department as long as funding sources are available.
Assessment method: The department continues to encourage graduate students to publish with our departmental awards for publishing. In addition, we have created a policy that a published paper can count towards reducing their required credit hours for their PhD. The department chair continues to ask faculty members to set publishing goals, and to hold people

accountable for the goals they made. Assessment is the number of journal articles per FTE in research.

Results: Our goal is for every active scientist (faculty/staff/student) to contribute at least 2 papers per year to the department (one per year for newer graduate students). According to internal tracking for calendar year 2016, the UK Department of Biosystems and Agricultural Engineering had 34 publications from our 19 faculty members and twenty-three graduate students (thirteen masters, ten PH.D.s) in the BAE program in 2016.

Analysis of results and reflection: We were very close to our goal of 2 papers per scientist for 2016. This is an improvement on 2015 where we had 14 publications by 16 faculty members.

Ongoing improvement actions: Part of our decreased publication numbers was because of an aging faculty with impending retirements. We have replaced some retirements, and now have six assistant professors (four research/teaching). Ideally, publishing is an on-going part of the departmental culture. We have started recording and announcing publications at each faculty meeting and in a monthly departmental newsletter as an encouragement to keep publishing.

9. Movement of equipment needs to be monitored to reduce inventory burden. All faculty and staff are encouraged to keep inventory requirements in mind to reduce current problems locating equipment and computers.

Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. The November 2012 inventory and all inventories since have gone much more smoothly than did the November 2011 inventory, thanks to the database developed and populated by Alex Fogle, with Julie Tolliver's assistance. In August 2013, the faculty and staff were educated about inventory protocol, and we now do this yearly for new employees through an informal training session.

Results: We now have an accurate database of our capital and departmental (between $500 - $2000) equipment, complete with a photograph and location for each item purchased since 2013 (and every item over $2k purchased any year) and processes are in place to keep the database continuously updated.

Analysis of results and reflection: Our departmental database is current, and includes a location and photograph for each item. We are still working with PPD to correct our inventory list. This takes persistence because we have sent in the required paperwork several times for the same items and they have not yet been removed from our inventory. We upgraded to the bar code scanner to perform inventory. This works for 2/3 of our tagged items, however the old tags do not scan. Alex Fogle has found software that will let him scan both types of tags with his ipad to enable us to scan our entire inventory.

Ongoing improvement actions: Inventory is occurring this Fall, we will reevaluate the outcome.

10. Labs should be maintained in a presentable manner (while maintaining consideration for the need to be productive) so that they serve as a safe environment and are not a detriment to student recruitment.

Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. Alex Fogle initiated a major clean-up

of the labs in August 2012 with the intention of eliminating items that have not been used in the last 5 years. Labs are reviewed twice per year for accumulated clutter, and these areas are cleaned up as appropriate.

Results: Our goal is to have productive, safe, and orderly laboratories. We will save analytical samples until the data are published or for 5 years, whichever comes first. Apparatuses that have not been used for the past year or so will go to long-term storage, and be disposed of, if not used within 5 years. We have instituted yearly "dumpster days" to encourage lab clean-up.

Analysis of results and reflection: We are consistently making progress towards changing the lab culture and people are beginning to think of needed storage time and space when planning experiments. This is a change of culture for the department and will require consistent vigilance to reinforce our new culture.

Ongoing improvement actions: Alex Fogle, BAE's facilities manager, reports to the manager's group on storage space, especially when it becomes limited and is in need of being cleared out. He has identified outdated equipment that will be sent to the UK auction in the Spring. We have made "Dumpster Day" an annual event, so people are getting in the habit of a yearly lab clean-up. Off-campus storage locations are being reevaluated.

Implementation Plan Report
Biosystems and Agricultural Engineering
University of Kentucky
Update 2015 – 2016

1. Devise a plan to support machine systems automation engineering in the long run.
Assessment method: The number of machine systems technical elective courses available to our machinery students, and the number of machinery students in those courses.
Results:

Academic Year	BAE 417	BAE 515 Fluid Power	BAE 599 Component Design	BAE 599 Control of Off-Road Vehicles	Total (by year)
12-13 F	4	-	-	-	
12-13 S	-	-	-	-	4
13-14 F	20	-	-	-	
13-14 S	-	4	7	-	31
14-15 F	32	7	-	-	
14-15 S	-	-	-	15	54
15-16 F	29	10	-	-	
15-16 S	-	-	9	-	48

Analysis of results and reflection: The number of students in our machinery classes grew exponentially when we hired our two new machinery professors (2012, 2013). Enrollment has stayed steady in the machinery courses.

Ongoing improvement actions: We will continue to support this area with teaching resources.

2. Determine future department direction based on current areas with strong faculty support and identify areas that need more support.
Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. We held faculty meetings in August 2012 to agree on a faculty hiring order.
Results: The course at issue was our senior design course BAE 427: Structures and Environment Engineering. This required course (our students are required to take 3 of 4 classes on a list) had not been taught for three years prior to the departmental self-study because we did not have sufficient faculty support to teach it. The larger question was whether or not our department wanted to continue to support the controlled environment subspecialization. Our discussion at the faculty retreat confirmed that we want to keep offering this course.

In addition we held a faculty retreat again in the Summer 2015 where we discussed future departmental direction. BAE may have up to 5 retirements in the next 5 year, and replacing these faculty members provides an opportunity to redirect our department if desired. As a faculty we agreed to recruit a new assistant professor to teach BAE 427, and this position

was filled in July, 2016. The course has been taught by one of Dr. Colliver's PhD students who works in industry in the Controlled Environment area, and the students are very complimentary of his knowledge and teaching ability, and Christian Tabor will teach the course again this year while Dr. Hayes sits in and prepares to teach the course herself in Spring, 2018.

Analysis of results and reflection: The discussion we had within the department was a healthy one, and one that was necessary. Not only did we solve our immediate concern regarding offering the BAE 427 course, but we have chosen to rededicate ourselves to livestock system engineering, hiring 3 faculty in that area this past year (Joshua Jackson, Morgan Hayes, and Mick Peterson).

Ongoing improvement actions: We developed a long-term hiring plan to focus on fewer areas but with more depth in each area. This was begun at the retreat (Summer, 2014) and continued throughout the year at faculty meetings, and at the Summer retreat in 2015. We have a list of prioritized positions, and we hired 2 assistant professors, 1 full professor, and 1 lecturer this past year (and are in the process of hiring another assistant professor).

3. Publications or building plans that still have some value should be considered for revision if faculty, with expertise in the area, are still an active part of the department. Original authors should be a consideration for making a revision, if available. Web links should be reviewed so that the number of broken links to internal publications and plans are resolved.

Assessment method: This recommendation was accepted by external review committee recommendation. In February, 2013, we hired an Extension Associate Senior, Karin Pekarchik, to coordinate this effort. In 2015-2016 the extension faculty worked with Dr. Tanya Dvorak to reinvigorate our extension programs by defining objectives, goals, and performing situational analyses.

Results: In past years we moved the older publications and plans to the archive, and a warranty disclaimer was added to each individual plan or publication. The warranty disclaimer is found both on the webpage and then on the first page of the PDF, in instances where there is an attachment that can be downloaded. The archive can be found at http://www.bae.uky.edu/ext/Plans/default.shtm. Karin has initiated an overhaul of our extension webpages based on the discussions the departmental extension faculty have had with Dr. T. Dvorak. Individual faculty members are initiating plans to rewrite some of the older, but still relevant, publications.

Analysis of results and reflection: Much care was taken in crafting the warranty disclaimer to ensure that the public would understand that these archived items are conceptual plans only. Every effort has been made to ensure that the warranty disclaimer is prominent and, even if the plan or publication is downloaded, that it remains with the publication/plan as the first page of the document.

Ongoing improvement actions: The entire website will be audited this year by a team of interested stakeholders (one of which is an extension agents). Plans and publications will continue to be moved into the archive when they reach five or more years since publication date in instances when it is not appropriate to update them or the author has chosen not to do so. When they are moved to the archive, the warranty disclaimer is added.

4. Lab facilities are an asset to the department, and a mechanism should be adopted for better coordination of labs and equipment.
   Assessment method: This recommendation was accepted by external review committee recommendation. This topic was brought to the faculty in 2013. This item is assessed by monitoring faculty member's ability to conduct their projects in the space assigned to them.
   Results: We improved the coordination of laboratory equipment use by creating a lab manger position who oversees these issues. Consequently labs are being better utilized. We have designated some of our underutilized labs to be shared-use facilities so that projects which need more space intermittently will have room to expand temporarily. We also use the shared-use lab for teaching because, with our increased enrollment, we need additional space for student laboratories.
   Analysis of results and reflection: The situation has improved, however we continue to work on freeing up space for new activities. Being an engineering department, our faculty members build equipment, and the timely disposal of these innovations is a continual challenge.
   Ongoing improvement actions: Our facilities supervisor works with the other managers in BAE to identify and discard items that are no longer in use. We have instituted a yearly "dumpster day" to encourage the entire department to clean their labs. This has worked well. Our facilities manager has also been diligent about moving old projects to storage, and surplussing items that are no longer used.

5. Growth areas in general should be evaluated to determine the level of support and specialty courses needed to accommodate students.
   Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. During the summer of 2013 we determined, as a department, what our ideal enrollment growth would be. This was followed by (SU/FA 2013) the development of a recruitment plan to encourage students to major in under-populated specializations.
   Results: We continue to have lower enrollment in our Controlled Environment and our Food Engineering area, however we are seeing signs of increased interest in both of these areas.
   Analysis of results and reflection: This is the second year we have seen freshman interested in Controlled Environment and Food Engineering, so we believe we are on the right track. Three of our four new faculty this year work in the area of controlled environment, so we believe additional students will be attracted to this specialization.
   Ongoing improvement actions: We will continue with our recruitment strategies and monitor the results.

6. The department should help students to develop ways to market themselves by using more recognizable terms for résumés and other forms of communication with prospective employers.
   Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. In the summer of 2013, we devised a

simple, clear, consistent message regarding our department and we display this message on the web page and educate our students to promote themselves in this manner.
Results: Both BAE 102 and BAE 400 have incorporated "BAE elevator speeches" into their courses, so we are beginning earlier to encourage the students to develop their marketing message and then reinforcing this again in their senior year.
Analysis of results and reflection: BAE is a fairly unique major, especially within Engineering because there is only one program of BAE per state. BAE departments are associated with the Land Grant system only. Another challenge is that BAE keeps reinventing the profession to attract more students, which is working, but our marketing message keeps changing. Considerable effort has been made to promote the department in a consistent way to as many arenas as possible. Our goal is to educate our students to market themselves clearly and accurately.
Ongoing improvement actions: We continue to work with the students. We continue to improve our marketing description on our web page, and use that description consistently in all our recruitment materials.

7. Extension specialists need to explore current options for program delivery that could reduce unnecessary travel and that would accommodate teaching schedules.
Assessment method: This recommendation was accepted by external review committee recommendation. On February 11, 2013, we hired an Extension Associate Senior, Karin Pekarchik, to assist with distance learning and web delivery pedagogy and technology.
Results: During our faculty search and interview process for the livestock systems engineering position, the department utilized skype and virtual meetings frequently to connect with county extension agents and receive input.
Analysis of results and reflection: The use of lync/skype technology was very successful. We have several ag agents attend the interviews and provide feedback regarding our interview candidates.
Ongoing improvement actions: As we work toward reinvigorating our extension programs, we continue to think of creative ways to reach our extension clientele. During the academic year 2015-2016 we continued to implement our extension marketing plan to improve our ability to reach our extension clientele.

8. The department needs to strongly encourage publication as a visible way of documenting activity. The department should send a consistent message to graduate students regarding publication of their work and explore a publishing incentive program like that used by the UK Entomology Department as long as funding sources are available.
Assessment method: The department continues to encourage graduate students to publish with our departmental awards for publishing. In addition, we have created a policy that a published paper can count towards reducing their required credit hours for their PhD. The department chair continues to ask faculty members to set publishing goals, and to hold people accountable for the goals they made. Assessment is the number of journal articles per FTE in research.

Results: Our goal is for every active scientist (faculty/staff/student) to contribute at least 2 papers per year to the department (one per year for newer graduate students). According to reported figures for the 128th KAES Annual Report for calendar year 2015, the UK Department of Biosystems and Agricultural Engineering had 14 publications from our 16 faculty members and twenty graduate students (twelve masters, eight PH.D.s) in the BAE program in 2015-2016.
Analysis of results and reflection: We did not meet our goal of 2 papers per scientist for the latest reporting period.
Ongoing improvement actions: Part of our decreased publication numbers was because of an aging faculty with impending retirements. We have replaced some retirements, and now have six assistant professors (four research/teaching). Ideally publishing is an on-going part of the departmental culture. We have started recording and announcing publications at each faculty meeting as an encouragement to keep publishing.

9. Movement of equipment needs to be monitored to reduce inventory burden. All faculty and staff are encouraged to keep inventory requirements in mind to reduce current problems locating equipment and computers.
Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. The November 2012 inventory and all inventories since have gone much more smoothly than did the November 2011 inventory, thanks to the database developed and populated by Alex Fogle, with Julie Tolliver's assistance. In August 2013, the faculty and staff were educated about inventory protocol, and we now do this yearly for new employees through an informal training session.
Results: We now have an accurate database of our capital and departmental (between $500 - $2000) equipment, complete with a photograph and location for each item purchased since 2013 (and every item over $2k purchased any year) and processes are in place to keep the database continuously updated.
Analysis of results and reflection: Our departmental database is current, and includes a location and photograph for each item. We are still working with PPD to correct our inventory list. This takes persistence because we have sent in the required paperwork several times for the same items and they have not yet been removed from our inventory.
Ongoing improvement actions: We upgraded to the bar code scanner to perform inventory. This works for 2/3 of our tagged items, however the old tags do not scan. Alex Fogle has found software that will let him scan both types of tags with his ipad to enable us to scan our entire inventory.

10. Labs should be maintained in a presentable manner (while maintaining consideration for the need to be productive) so that they serve as a safe environment and are not a detriment to student recruitment.
Assessment method: This suggestion was accepted by internal recommendation and also accepted by external review committee recommendation. Alex Fogle initiated a major clean-up of the labs in August 2012 with the intention of eliminating items that have not been used in the

last 5 years. Labs are reviewed twice per year for accumulated clutter, and these areas are cleaned up as appropriate.

Results: Our goal is to have productive, safe, and orderly laboratories. We will save analytical samples until the data are published or for 5 years, whichever comes first. Apparatii that have not been used for the past year or so will go to long-term storage, and be disposed of, if not used within 5 years. We have instituted yearly "dumpster days" to encourage lab clean-up.

Analysis of results and reflection: We are consistently making progress towards changing the lab culture and people are beginning to think of needed storage time and space when planning experiments. This is a change of culture for the department and will require consistent vigilance to reinforce our new culture.

Ongoing improvement actions: Alex Fogle, BAE's facilities manager, reports to the manager's group on storage space, especially when it becomes limited and is in need of being cleared out. He has identified outdated equipment that will be sent to the UK auction in the Spring. We have made "Dumpster Day" an annual event, so people are getting in the habit of a yearly lab clean-up.

Implementation Plan Report
Biosystems and Agricultural Engineering
University of Kentucky
Update 2014 – 2015

1. Devise a plan to support machine systems automation engineering in the long run.

Assessment method: The number of machine systems technical elective courses available to our machinery students, and the number of machinery students in those courses.

Results:

Academic Year	BAE 417	BAE 515 Fluid Power	BAE 599 Component Design	BAE 599 Control of Off-Road Vehicles	Total (by year)
12-13 F	4	-	-	-	4
12-13 S	-	-	-	-	
13-14 F	20	-	-	-	31
13-14 S	-	4	7	-	
14-15 F	32	7	-	-	54
14-15 S	-		-	15	
15-16 F	29	10	-		Incomplete year (39 to date)

Analysis of results and reflection: The number of students in our machinery classes has grown exponentially since hiring our two new machinery professors.

Ongoing improvement actions: We will continue to support this area with teaching resources.

2. Determine future department direction based on current areas with strong faculty support and identify areas that need more support.

Assessment method: The development of a departmental hiring plan.

Results: Faculty meetings were held in August 2012 to agree on a faculty hiring order. Course offerings were discussed in December 2012 to meet the course schedule deadline. The course at issue is our senior design course BAE 427: Structures and Environment Engineering. This required course (our students are required to take 3 of 4 classes on a list) had not been taught for three years because we did not have sufficient faculty support to teach it. The larger question was whether or not our department wanted to continue to support the controlled environment sub-specialization. Our discussion at the faculty retreat (see below) confirmed that we want to keep offering this course.

In addition we held a faculty retreat again in the summer 2015 where we discussed future departmental direction. BAE may have up to 5 retirements in the next 5 year, and replacing these faculty members provides an opportunity to redirect our department if desired. As a faculty, we agreed to recruit a new assistant professor to teach BAE 427; this position is currently posted and will close November 1, 2015. We expect to have the individual on campus by summer 2016. In the meantime, the course is being taught by one of Dr. Colliver's PhD students who works in industry in the Controlled Environment area, and the students are very complimentary of his knowledge and teaching ability.

Analysis of results and reflection: The discussion we've begun having within the department is a healthy one, and one that is necessary. We likely will have many more discussions before coming to consensus, but we have solved our immediate concern regarding offering the BAE 427 course.

Ongoing improvement actions: We are developing a long-term hiring plan to focus on fewer areas, but with more depth in each area. This discussion began at the retreat (summer 2014) and continued throughout the year at faculty meetings, and at the summer retreat in 2015. We have a list of positions which we now need to prioritize.

3. Publications or building plans that still have some value should be considered for revision if faculty members, with expertise in the area, are still an active part of the department. Original authors should be a consideration for making a revision, if available. Web links should be reviewed so that the number of broken links to internal publications and plans are resolved.

Assessment method: The revision outdated publications and updating the department's website.

Results: In February, 2013, we hired an Extension Associate Senior, Karin Pekarchik, to coordinate this effort. An extensive overhaul of the website, including Extension pages, was undertaken during 2013 and into 2014. Broken links were corrected, and page navigation was redesigned to allow for easier access by users. Once the basic mechanisms of the website were corrected, an archival project of outdated plans and publications was initiated. Outdated materials — plans and publications over five years old — were moved to an archive page on the website. In addition to moving the older publications and plans to the archive, a warranty disclaimer was added to each individual plan or publication. The warranty disclaimer is found both on the webpage and then on the first page of the PDF, in instances where there is an attachment that can be downloaded. The archive can be found at http://www.bae.uky.edu/ext/Plans/default.shtm.

Analysis of results and reflection: BAE has wrestled with this issue of maintaining older publications and building plans for several years due to differing opinions among the faculty members regarding the usefulness of older extension publications. In the end, the Extension faculty felt that these publications served a purpose, and that with an appropriate warranty disclaimer, the older material would continue to benefit the public. Much care was taken in crafting the warranty disclaimer to ensure that the public would understand that these archived items are conceptual plans only. Every effort has been made to ensure that the warranty disclaimer is prominent and, even if the plan or publication is downloaded, that it remains with the publication/plan as the first page of the document.

Ongoing improvement actions: The entire website will continue to be regularly reviewed, with an eye toward usability, accessibility, and elimination of broken links. Plans and publications will continue to be moved into the archive when they reach five or more years since publication date in instances when it is not appropriate to update them or the author has chosen not to do so. When they are moved to the archive, the warranty disclaimer is added.

4. Lab facilities are an asset to the department, and a mechanism should be adopted for better coordination of labs and equipment.

Assessment method: Monitoring faculty member's ability to conduct their projects in the space assigned to them.

Results: We improved the coordination of laboratory equipment use by creating a lab manger position. The lab manger oversees these issues and consequently labs are being better utilized. We have designated some of our underutilized labs to be shared-use facilities so that projects which need more space intermittently will have room to expand temporarily. We also use the shared-use lab for teaching because with our increased enrollment we need additional space for student laboratories.

Analysis of results and reflection: The situation has improved; however, we continue to work on freeing up space for new activities. Being an engineering department, our faculty members build equipment, and storing these innovations is proving challenging.

Ongoing improvement actions: Our facilities supervisor works with the other managers in BAE to identify and discard items that are no longer in use. We have instituted a yearly "dumpster day" to encourage the entire department to clean their labs. This has worked well. Our facilities manager has also been diligent about moving old projects to storage, and designating items not used in over 5 years as surplus.

5. Growth areas in general should be evaluated to determine the level of support and specialty courses needed to accommodate students.
   Assessment method: The development of a departmental enrollment plan.
   Results: During the summer of 2013, we determined, as a department, what our ideal enrollment growth would be. This was followed (in summer and fall of 2013) by the development of a recruitment plan to encourage students to major in under-populated specializations.
   Analysis of results and reflection: We continue to have lower enrollment in our Controlled Environment and our Food Engineering area; however, we are seeing signs of increased interest in both of these areas. This is the second year we have seen freshman interested in Controlled Environment and Food Engineering, so we believe we are on the right track.
   Ongoing improvement actions: We will continue with our recruitment plan and monitor the results.

6. The department should help students to develop ways to market themselves by using more recognizable terms for résumés and other forms of communication with prospective employers.
   Assessment method: Development of a clear, consistent marketing plan for the department.
   Results: In the summer of 2013, we devised a simple, clear, consistent message regarding our department and we display this message on the web page and educate our students to promote themselves in this manner. Both BAE 102 and BAE 400 have incorporated “BAE elevator speeches” into their courses, so we are beginning earlier to encourage the students to develop their marketing message and then reinforcing this again in their senior year.
   Analysis of results and reflection: BAE is a fairly unique major, especially within Engineering because there is only one program per state as they are associated only with the Land Grant universities. Another challenge is that BAE keeps reinventing the profession to attract more students, which is working, but our marketing message keeps changing. Considerable effort has been made to promote the department in a consistent way in as many arenas as possible. Our goal is to educate our students to market themselves clearly and accurately.
   Ongoing improvement actions: Continue to work with the students. Continue to improve our marketing description on our web page, and use that description consistently in all our recruitment materials.

7. Extension specialists need to explore current options for program delivery that could reduce unnecessary travel and would accommodate teaching schedules.

Assessment method: Determine the need for specific programming and create distance learning opportunities tailored for Extension specialists.
Results: On February 11, 2013, we hired an Extension Associate Senior, Karin Pekarchik, to assist with distance learning and web delivery pedagogy and technology. Last year, SP 2015, BAE debuted a series of "train-the-trainer" webinars, designed to transfer engineering information to Extension agents. Beverly Miller presented "Control Overhead through Building Energy Management"; Richard Warner presented "Home Drip Irrigation Systems," and Matt Dixon presented "Agricultural Features of the Ag Weather Center's New Website." Unfortunately these were not successful, as very few people attended the workshops.
Analysis of results and reflection: The departmental objective is to use departmental resources as efficiently as possible, including program delivery. To this end, the department wants to provide support to faculty members who want to deliver programs from a distance. We need to actively poll our clientele to determine what workshops they would like to see and would actually attend.
Ongoing improvement actions: Continue to think of creative ways to reach our extension clientele. In the summer 2015 retreat, we developed an extension marketing plan which we are implementing to improve our ability to reach our extension clientele.

8. The department needs to strongly encourage publication as a visible way of documenting activity. The department should send a consistent message to graduate students regarding publication of their work and explore a publishing incentive program like that used by the UK Entomology Department, as long as funding sources are available.
Assessment method: Assessment is based upon the number of journal articles per FTE in research.
Results: During spring 2013 evaluations, the department determined each faculty member's publication goals for 2013-2014-2015 and has held people accountable for the goals they set. The departmental goal is for every active scientist (faculty/staff/student) to contribute at least 2 papers per year to the department (one per year for newer graduate students). The UK Department of Biosystems and Agricultural Engineering has seventeen faculty members and twenty-eight graduate students (twenty-two masters, six PH.D.s) in the BAE program in spring 2015, according to enrollment statistics from the UK College of Engineering. According to reported figures for the 127th KAES Annual Report for calendar year 2014, the department met this goal.
Analysis of results and reflection: We met our goal of 2 papers per scientist for the latest reporting period.

Ongoing improvement actions: Continue to monitor progress in publications, possibly tracking on a graph so scientists have a visual encouragement to continue to publish. Ideally, publishing is an on-going part of the departmental culture. We have started recording them and announcing publications at each faculty meeting as an encouragement to keep publishing. BAE will also continue to reward graduate students with money for publishing, as an ongoing incentive.

9. Movement of equipment needs to be monitored to reduce inventory burden. All faculty and staff are encouraged to keep inventory requirements in mind to reduce current problems locating equipment and computers.
Assessment method: Develop an inventory system to identify the location and value of all BAE equipment.
Results: The November 2012 inventory went much more smoothly than did the November 2011 inventory, thanks to the database developed and populated by Alex Fogle, with Julie Tolliver's assistance. In August 2013, the faculty and staff were educated about inventory protocol, and we now do this yearly for new employees through an informal training session. We now have an accurate database of our capital and departmental equipment (valued from $500 - $2000), complete with a photograph and location for each item purchased since 2013 and every item over $2k purchased any year. Processes are in place to keep the database continuously updated.
Analysis of results and reflection: Our departmental database is current, and includes a location and photograph for each item. We are still working with PPD to correct our inventory list. This takes persistence because we have sent in the required paperwork several times for the same items and they have not yet been removed from our inventory.
Ongoing improvement actions: We upgraded to a bar code scanner to perform inventory. This works for 2/3 of our tagged items, however the old tags do not scan. Alex Fogle has found software that will let him scan both types of tags with his iPad to enable us to scan our entire inventory. We will continue to recorded tagged items and enter them into the database.

10. Labs should be maintained in a presentable manner (while maintaining consideration for the need to be productive), so that they serve as a safe environment and are not a detriment to student recruitment.
Assessment method: Identify processes and educate scientists about correct procedures for maintenance of laboratory space.
Results: Our goal is to have productive, safe, and orderly laboratories. Alex Fogle initiated a major clean-up of the labs in August 2012 with the intention of eliminating items that have not been used in the last 5 years. Labs are reviewed

twice per year for accumulated clutter, and these areas are cleaned up as appropriate. We will save analytical samples until the data are published or for 5 years, whichever comes first. Apparatii that have not been used for the past year or so will go to long-term storage, and be disposed of, if not used within 5 years. We have instituted yearly “dumpster days” to encourage lab clean-up.

Analysis of results and reflection: We are consistently making progress towards changing the lab culture and people are beginning to think of needed storage time and space when planning experiments. This is a change of culture for the department and will require consistent vigilance to reinforce our new culture.

Ongoing improvement actions: Alex Fogle, BAE’s facilities manager, reports to the manager’s group on storage space, especially when it becomes limited and is in need of being cleared out. He has identified outdated equipment that will be sent to the UK auction in the spring. We have made “Dumpster Day” an annual event, so people are getting in the habit of a yearly lab clean-up.

Biosystems and Agricultural Engineering
University of Kentucky
Implementation Plan Report
Update 2013 – 2014

1. Devise a plan to support machine systems automation engineering in the long run.

Assessment method: The faculty will devise and implement a plan to support machine systems automation engineering.

Results: We held interviews in January 2013, with the intent to have a new machine systems engineer faculty member in the department by fall ’13. The machine systems engineer faculty position was advertised in November 2012; Michael Sama, Ph.D., joined the BAE faculty as Assistant Professor in July 2013.

Analysis of results and reflection: We followed our plan to support machine systems automation engineering in the long run. Dr. Sama will teach machine systems engineering classes; in FA 13 he will teach BAE 400 Senior Seminar.

Ongoing improvement actions: In 2014, we hired a faculty member in food engineering (candidate began work July 3, 2014). We are currently recruiting a bioprocessing engineer faculty member. Four candidates will be interviewed in spring, 2015. While these positions are not in the machine systems area, additional faculty members over which to distribute the departmental required teaching load frees up our machine systems faculty to teach technical electives to our machinery students, thus providing the desired support to this area.

2. Determine future department direction based on current areas with strong faculty support and identify areas that need more support.

Assessment method: Faculty members will determine the future direction of the department and identify areas that need more support

Results: The BAE Department held faculty meetings in August 2012 to agree on faculty hiring order. The course at issue was our senior design course BAE 427: Structures and Environment Engineering. This course was not taught for three years because there was insufficient faculty support to teach it. The larger question was whether or not our department wants to continue to support the structures and environment sub-specialization. Our discussion at the faculty retreat (see below) confirmed that we want to keep offering this course.

In addition we held a faculty retreat this summer (16 hours) where we discussed future departmental direction. BAE may have up to 5 retirements in the next 5 years, and replacing these faculty members provides an opportunity to redirect our department, if desired. The faculty voted overwhelmingly to focus on

fewer areas and have more faculty members within each area. Currently, we have many areas and a few faculty members in each area.

Analysis of results and reflection: The discussion we've begun having within the department is a healthy one, and one that is necessary. We will likely have many more discussions before coming to consensus, but we have solved our immediate concern regarding offering the BAE 427 course.

Ongoing improvement actions: We are developing a long-term hiring plan to focus on fewer areas, but with more depth in each area. This was begun at the retreat (summer, 2014) and is continuing throughout the year at faculty meetings.

We hired one of our PhD students with extensive industrial experience to teach BAE 427 Structures and Environment Engineering for the spring 2015.

3. Publications or building plans that still have some value should be considered for revision if faculty with expertise in the area are still an active part of the department. Original authors should be a consideration for making a revision, if available. Web links should be reviewed so that the number of broken links to internal publications and plans are resolved.

Assessment method: The departmental determination of the future of outdated publications and building plans, as well as review and correct any broken links on the Website.

Results: In February, 2013, Karin Pekarchik, was hired as an Extension Associate Senior, to coordinate this effort along with our faculty Extension Coordinator. Revising our Extension web page and publications was a goal on both of their 2013 work plans.

An extensive overhaul of the website, including Extension pages, was undertaken during 2013 and into 2014. Broken links were corrected, and page navigation was redesigned to allow for easier access by users. Once the basic mechanisms of the website were corrected, an archive project of outdated plans and publications was initiated. Outdated materials —plans and publications over five years old—were moved to an archive page on the website. In addition to moving the older publications and plans to the archive, a warranty disclaimer was added to each individual plan or publication. The warranty disclaimer is found both on the webpage and then on the first page of the PDF, in instances where there is an attachment that can be downloaded. The archive can be found at http://www.bae.uky.edu/ext/Plans/default.shtm.

Analysis of results and reflection: BAE has wrestled with this issue of maintaining older publications and building plans for several years due to differing opinions among the faculty members regarding the usefulness of older extension publications. In the end, the Extension faculty felt that these publications serve a purpose, and that with an appropriate warranty disclaimer,

the older material would continue to benefit the public. Much care was taken in crafting the warranty disclaimer to ensure that the public would understand that these archived items are conceptual plans only. Every effort has been made to ensure that the warranty disclaimer is prominent and, even if the plan or publication is downloaded, that it remains with the publication/plan as the first page of the document.

Ongoing improvement actions: The entire website will continue to be regularly reviewed, with an eye toward usability, accessibility, and elimination of broken links. Plans and publications will continue to be moved into the archives when they reach five or more years since publication date in instances when it is not appropriate to update them or the author has chosen not to do so. When they are moved to the archive, the warranty disclaimer is added.

4. Lab facilities are an asset to the department, and a mechanism should be adopted for better coordination of labs and equipment.

Assessment method: The departmental faculty will devise and implement a mechanism to better coordinate labs and equipment.

Results: This topic was brought to a faculty meeting in the spring of 2013. We have improved the coordination of equipment by creating a lab manger position who oversees equipment use. Labs are being better utilized. We have designated some of our underutilized labs to be shared-use facilities so that projects which need more space intermittently will have room to expand temporarily. We also use the shared-use lab for teaching, because with our increased enrollment we need additional space for student laboratories.

Analysis of results and reflection: The situation has improved, however we continue to work on freeing up space for new activities. Being an engineering department, our faculty members build equipment, and storing these innovations is proving increasingly challenging.

Ongoing improvement actions: Our facilities supervisor works with the other managers in BAE to identify and discard items that are no longer in use. We are slowly decreasing our inventory of stored innovations.

5. Growth areas in general should be evaluated to determine the level of support and specialty courses needed to accommodate students.

Assessment method: An increase in enrollment in targeted growth areas.

Results: During the summer of 2013 we determined, as a department, what our ideal enrollment growth would be. This was followed by (SU/FA 2013) the development of a recruitment plan to encourage students to major in under-populated specializations. We continue to have lower enrollment in our

Controlled Environment area; however there are 4 students in the freshman class who list this as their area of interest.
Analysis of results and reflection: This is the first year we have seen freshman interested in Controlled Environment, so our recruitment plan is beginning to show results.
Ongoing improvement actions: We will continue with our recruitment plan and monitor the results.

6. The department should help students to develop ways to market themselves by using more recognizable terms for résumés and other forms of communication with prospective employers.
Assessment method: The implementation of a student-based marketing message in key BAE courses, as well as on the Website.
Results: Both BAE 102 and BAE 400 have incorporated "BAE elevator speeches" into their courses, so we are beginning earlier to encourage the students to develop their marketing message and then reinforcing this again in their senior year.
Analysis of results and reflection: BAE is a fairly unique major, especially within Engineering, because there is only one program per state which is associated with the Land Grant system only. Another challenge is that BAE keeps reinventing the profession to attract more students, which is working. Considerable effort should be made to promote the department in a consistent way to as many arenas as possible. Our goal is to educate our students to market themselves clearly and accurately.
Ongoing improvement actions: We will devise a simple, clear, consistent marketing message regarding our department and will display this message on the web page to educate our students. The department will use that description consistently and will continue to work with the students.

7. Extension specialists need to explore current options for program delivery that could reduce unnecessary travel and that would accommodate teaching schedules.
Assessment method: This department will implement procedures to reduce unnecessary travel and accommodate teaching schedules.
Results: On February 11, 2013, BAE hired an Extension Associate Senior, Karin Pekarchik, to assist with distance learning and web delivery pedagogy and technology. Five distance learning Extension videos were produced in FY 2013-2014.
Analysis of results and reflection: The departmental objective is to use departmental resources as efficiently as possible, including program delivery. To

this end, the department wants to provide support to faculty members who want to deliver programs from a distance. The department response was strong, with 5 videos being produced. Ag com has assisted with filming of the webinars.
Ongoing improvement actions: During Fall 2014, BAE will debut a series of "train-the-trainer" webinars, designed to transfer engineering information to Extension agents. Beverly Miller will present Control Overhead through Building Energy Management in November 2014; Richard Warner – Home Drip Irrigation Systems; Mike Montross – Measuring Grain Bin Capacity Using GPS and GIS; John Wilhoit and Larry Swetnam – Labor-Saving Methods for Tobacco Warehousing and Matt Dixon – Agricultural Features of the Ag Weather Center's New Website. The department will continue to think of creative ways to reach our extension clientele.

8. The department needs to strongly encourage publication as a visible way of documenting activity. The department should send a consistent message to graduate students regarding publication of their work and explore a publishing incentive program like that used by the UK Entomology Department as long as funding sources are available.
Assessment method: Increased publications by faculty and graduate students within the BAE Department. Our goal is for every active scientist (faculty, staff, or student) to contribute at least 2 papers per year to the department (one per year for newer graduate students).
Results: During spring 2013 evaluations, each faculty member determined their publication goals for 2013-2014-2015. From December 2013 through December 2014, people were held accountable for the goals they set. According to reported figures for the 126th KAES Annual Report for calendar year 2013, the UK Department of Biosystems and Agricultural Engineering has eighteen faculty plus three emeriti for a total of twenty-one faculty members. According to enrollment statistics from the UK College of Engineering, there were twenty-eight graduate students (twenty-two masters, six PH.D. candidates) in the BAE program in spring 2014, see http://www.engr.uky.edu/enrollment-stats/files/2013/02/EnrollmentStats-Spring2010-to-Fall2014-v2_2.pdf. Three books or book chapters were reported as being published by a BAE faculty member. In addition, forty-two refereed journal articles plus thirteen other research publications were published with BAE authors, for a total of fifty-eight publications for the 2013 calendar year. Using the eighteen active faculty and six PH.D. graduate students, the fifty-eight publications are spread among twenty-four scientists for an average of 2.42 publications per scientist per year.
Analysis of results and reflection: We met our goal of 2 papers per scientist for the latest reporting period.

Ongoing improvement actions: The department will continue to reward graduate students with money for publishing, as an ongoing incentive. It will also continue to monitor progress in publications, possibly tracking on a graph, so scientists have a visual encouragement to continue to publish. Ideally, publishing is an on-going part of the departmental culture.

9. Movement of equipment needs to be monitored to reduce inventory burden. All faculty and staff are encouraged to keep inventory requirements in mind to reduce current problems locating equipment and computers.
   Assessment method: The creation of an accurate database of our capital and departmental equipment (with a value of $500-$2000), complete with a photograph and location for each item by 2013 and to keep the database continuously updated.
   Results: The November 2012 inventory went much more smoothly than did the November 2011 inventory, thanks to the database developed and populated by Alex Fogle, with Julie Tolliver's assistance. In August 2013, faculty and staff were educated about inventory protocol, and the department now conducts this training annually for new employees through an informal training session.
   Analysis of results and reflection: Our departmental database is current, and includes a location and photograph for each item. We are working with PPD to correct our inventory list. This takes persistence because we have sent in the required paperwork several times for the same items, but they have not yet been removed from our inventory.
   Ongoing improvement actions: We upgraded to the bar code scanner to perform inventory. This works for 2/3 of our tagged items, however the old tags do not scan. Alex Fogle has requested new tags for our older-tagged items to make our entire inventory to enable us to scan our entire inventory.

10. Labs should be maintained in a presentable manner (while maintaining consideration for the need to be productive) so that they serve as a safe environment and are not a detriment to student recruitment.
    Assessment method: The maintenance of productive, safe, and orderly laboratories.
    Results: Alex Fogle initiated a major clean-up of the labs in August 2012 with the intention of eliminating items that have not been used in the last 5 years. We will save analytical samples until the data are published or for 5 years, whichever comes first. Apparatii that have not been used for the past year or so will go to long-term storage, and be disposed of, if not used within 5 years. In August 2014, a dumpster was filled to overflowing during clean up.

Analysis of results and reflection: We are consistently making progress towards changing the lab culture and people are beginning to think of needed storage time and space when planning experiments. This is a change of culture for the department and will require consistent vigilance to reinforce our new culture.

Ongoing improvement actions: Labs are reviewed annually for accumulated clutter, and these areas are cleaned up as appropriate. Alex Fogle, BAE's facilities manager, reports that storage space is currently limited and is in need of being cleared out. He has identified outdated equipment that will be sent to the UK auction in spring 2015. We intend to make "Dumpster Day" an annual event, so people get in the habit of a yearly lab clean-up.

UK Program Review Implementation Plan

*This **required** form is described as Appendix A in AR II-I.0.6.*

College/Unit: Biosystems and Agricultural Engineering **Date:** October, 2012

Recommendation/ Suggestion	Source I/E/H*	Accept/ Reject**	Unit Response (resulting goal or objective)	Actions (including needed resources)	Time Line
Devise a plan to support machine systems automation engineering in the long run.	I/E	A	Department reevaluated our hiring plan, and decided to hire a Machine Systems Engineer before the planned bioprocessing engineer.	We will hold interviews in January, with the intent to have a new faculty member in the department by Fall 2013.	Position advertised: November 2012; Interviews: January 2013; offer extended: February 2013
Determine future department direction based on current areas with strong faculty support and identify areas that need more support.	I/E	A	These difficult decisions regarding faculty hires and supported courses must be made by the entire faculty. Faculty consensus must be reached on whether or not to keep offering our Structures and Environment Course when we have no faculty member in Lexington to teach the course.	Held faculty meeting in August, 2012 to agree on faculty hiring order. Course offering: determined by December 2012 to meet course schedule deadline.	August 2012 December 2012
Effort is needed to ensure traditional areas such as water quality maintain appropriate lab equipment and technical support skills.	E	R	Our goal is to use our laboratory resources and technical staff efficiently. In order to best serve our diverse faculty we have pooled the technical staff resources and grouped our analytical equipment in shared labs. Departmental staff were reorganized a few years ago to eliminate this problem. Coordination with Alex Fogle or Manish Kulshrethra on lab/technician support needed should alleviate this problem.		
Explore extension opportunities to share resources and expertise with neighboring states (both where KY needs expertise and where KY has	I/E	A	Our goal is to collaborate with neighboring states so that we are able to meet the needs of the citizens of Kentucky in as efficient a manner as	Discuss opportunities with BAE chairs of Purdue, The Ohio State University, Penn State, and Tennessee	Summer 2013

expertise to lend).			possible.		
The need for flexibility within the department to accommodate students such as those preparing for biomedical fields is advised.	E	A	Our objective for our undergraduate curriculum is to provide a core set of courses that all students take; then give the students flexibility in their areas of specialization. Some of our flexibility in terms of BME is limited because very few undergraduate biomedical engineering courses are offered on campus, and those that are require senior status.	Educate all faculty members about the pre-biomedical engineering option to dispel misconceptions.	Seminar Spring 2013
BAE Faculty may not be equipped to adequately advise students preparing to go into the biomedical field. Teaming with College of Engineering to meet some of the needs of these students may be the best solution.	E	R	The department's goal is to maintain close ties with the Center for Biomedical Engineering so that our students are well-prepared for entering graduate school, and also for obtaining the latest information for our students regarding internships and REUs. Invite new BME faculty to give department seminars. Organize faculty/students to tour CBME when they offer an open house. Maintain communications with the Chair of BME.		
BAE should look for ways to promote the efforts of the department. The mechanization field day that was held on an annual basis several years ago was an effective tool that brought recognition to the department. While that may not be the appropriate venue today, similar efforts should be explored to determine the most appropriate way to showcase the programs within the department. This should extend to opportunities to promote BAE to industry.	E	R	Showcasing the programs in our department is a priority year round. Under some of the other recommendations we are addressing the visibility of the BAE department and ways to promote BAE to industry. The diversity of our departmental programs has increased greatly since the days of the mechanization field day, and it is unclear what venue would work to accomplish the recommendation.		
The College of Engineering has developed non-traditional academic schedules for the PEIK Institute that should be considered as possible models to better accommodate	E	R	I am unaware of any Extension schedule that has not been accommodated to allow that faculty person to teach. We have to defend the non-traditional use of classrooms,		

Extension schedules.			but we have always been willing to do this for anyone who has requested this.		
Publications or plans that still have some value should be considered for revision if faculty with expertise in the area are still an active part of the department. Original authors should be a consideration for revision if available. Web links should be reviewed so that the number of broken links to internal publications and plans are resolved.	E	A	BAE has wrestled with this issue for several years due to differing opinions among the faculty regarding the usefulness of older extension publications. Our goal is to update or archive all publications greater than 10 years old, and once that is done we will tackle the newer ones.	We hired an Extension Associate Sr. to coordinate this effort, along with our faculty Extension Coordinator. Revising our extension web page and publications is a goal on both of their 2013 work plans. I anticipate the work taking the entire calendar year.	2013
Credit for scholarly activities was indicated as a concern by various groups during the review. BAE has many internal resources that should be fully identified with current faculty if that expertise is still represented within the department.	E	A	I believe this recommendation is similar to the previous item – please see above.	The faculty extension coordinator will work with our senior extension associate faculty member to identify resources with current faculty.	2013
Lab facilities are an asset to the department. A mechanism should be adopted for better coordination of labs and equipment.	E	A	I believe this comment refers to some labs that are underutilized by the faculty assigned to them. We also have some labs that are over-utilized.	Bring this topic to a faculty meeting. Changing the way laboratory space is allocated would be a culture change for the department. We have improved the coordination of equipment by creating a lab manger position who oversees equipment use.	Spring 2013
The department should explore ways to collaborate with the College of Engineering on courses such as bioinstrumentation, etc.	E	A	Our unit's objective is to leverage resources in the bioinstrumentation area to offer a senior/graduate level course which serves the needs of our students, as well as the CBME and possibly EE students.	Talk to Larry Holloway and Dave Puleo regarding the possibility of co-teaching or cross-listing course Develop syllabus jointly if class is feasible and begin implementation through the College and Senate.	Spring 2013 Fall 2013
Growth areas in general should be evaluated to determine the level of support and specialty needed to accommodate students.	I/E	A	Our objective for the Department is to have balanced enrollment growth, consistent with our faculty strength and available space.	As a department determine what our ideal enrollment growth would be. Devise a recruitment plan to encourage students to major in under-populated specializations.	Summer 2013 Summer/Fall 2013
More resources may be needed in the future if other programs in other departments continue to promote specific BAE courses as technical courses for their majors. An example	E	A	Our goal is to have necessary resources in place to be prepared for enrollment growth.	Work with KHP to take BAE 103 off their elective list. Work with CE to predict BAE 202 enrollment in time to have sufficient	Fall 2012 Fall 2012 and ongoing

is BAE 103 where an increase in enrollment could be a burden on BAE faculty in the future.				resources in place.	
Undergraduates would benefit from more opportunities to be on the Ag campus. The department should explore possibilities that would bring students to functions on the Ag campus so that students feel more included in the College of Agriculture.	E	R	Students are free to attend any Ag functions they would like. BAE 102 students are encouraged to attend COE and COA functions, so that they understand they are welcome in both Colleges.		
While students who want to work can usually find opportunities, other avenues should be promoted that will provide students with experience in the field of study	I/E	A	Our goal is to have every student graduate with some BAE job experience, whether through working in the department or in industry.	Talk to Jeff Snow/Marci Hicks about working with alumni. Work with alumni to set up contact database for students to find internships. Educate students regarding internship opportunities	Spring 2013 Spring 2013-2015 Spring 2013-2015
The college should explore ways to improve access so that the DUS doesn't have to go to extreme measures to get student major information.	E	R (college concern)	Goal for department is to minimize efforts to retrieve data necessary for decision making, but this task needs to be handled at the college level. We'll talk to Dr. Grabau regarding this challenge and solicit his input on how to proceed.		
Communication with graduate students needs to be evaluated in areas such as course requirements, development of graduate committees (some students feel that they must rely on other students instead of faculty), and statistical support (again students feel that availability of the service is not readily apparent and spread by word of mouth by students).	E	A	Our departmental goal is to initiate standardized communication to graduate students so that the requirements are clearly laid out for the students and are consistent between students.	The new graduate students' seminar would be an excellent place to discuss the requirements. We could develop a flow chart for course and committee requirements. Our student services coordinator can be charged with staying current with the statistical consultant information.	Spring 2013 Summer 2013 Spring 2013
BAE has suffered in the past from name recognition issues. Considerable effort should be made to promote the department in as many arenas as possible.	I/E	A	This is a persistent challenge for all BAE-like departments in the country. One objective is to have more companies at the career fair that ask for our students.	Work with the Career Fair people to invite our alumni to rent a booth. Devise a simple, clear, consistent message regarding our dept. and display it on the web page and educate our students.	Spring 2013 Summer 2013

The Ag Student Council restricted access of BAE students, citing that BAE students are not in the College of Agriculture due to their degree in Engineering.	I/E	A	Historically our students have served on the Ag Student Council. Our goal is to have representation on the council.	Talk to Dr. Grabau regarding this issue and see what, if any, are his concerns.	Spring 2013
The department should help students develop ways to market themselves by using more recognizable terms for résumés and other forms of communication with prospective employers.	I/E	A	This relates to the recommendation two above this one. Our goal is to educate our students to market themselves clearly and accurately.	Devise a simple, clear, consistent message regarding our dept. and display it on the web page and educate our students.	Summer 2013
Extension specialists need to explore current options for program delivery that could reduce unnecessary travel and that would accommodate teaching schedules.	E	A	The departmental objective is to use departmental resources as efficiently as possible, including program delivery. To this end, the department wants to provide support to faculty members who want to deliver programs from a distance.	Our department is hiring an Extension Associate Senior to assist with distance learning and web delivery pedagogy and technology.	February 2013
Documentation of distance program delivery efforts is encouraged. Impact reports and other means of documenting success should be explored to assess if programs are producing the level of success that justifies the effort. Areas with the most impact may have to be favored over less productive efforts.	I/E	A	The departmental objective is to use departmental resources as efficiently as possible, including program delivery. To this end we must self-evaluate and continually improve our effectiveness.	Our extension associate senior will be charged with assisting faculty in evaluating programs also. In addition, I am asking for each faculty member to write specific program goals for 2013-2014, for which they will be held accountable.	February 2013 and ongoing
Extension specialists are encouraged to develop resources for agents and train them to deliver some high demand programs to reduce the burden on specialists. Specialists will remain in high demand for certain programs.	E	A	The departmental objective is to use departmental resources as efficiently as possible, including program delivery. To this end, the department wants to provide support to faculty members who want to deliver programs from a distance.	Our department is hiring an Extension Associate Senior to assist with distance learning and web delivery pedagogy and technology. I am asking for each faculty member to write specific program goals for 2013-2014, for which they will be held accountable, and these high-demand programs will be identified in this process.	February 2013
Extension publications and plans need serious attention. Many are outdated and may recommend materials and actions that are outdated, that we now know to be incorrect, or that could be potentially dangerous or present a safety issue. The department with assistance from the Extension coordinator should	I/E	A	The goal of the department is to have an up-to-date collection of extension products available on the web. There is also interest in keeping archives for historical purposes.	Our extension leader has organized the extension faculty to perform this review. It was decided that the outdated plans/pubs that have historical value will be clearly marked as such so outdated material will not be taken as current best practice. The extension	Fall 2012 – Fall 2013 Ongoing

develop a review schedule to work through all publications and plans as time permits.				leader is in charge of this revision.	
A clear position should be developed to make sure that the department's policy on plans is conveyed in such a manner that the department's position is understood and that agents and clientele aren't left with a feeling of ill-will toward the department.	E	A	The goal of the department is to have an up-to-date collection of extension products available on the web. There is also interest in keeping archives for historical purposes.	Our extension leader has organized the extension faculty to perform this review. It was decided that the outdated plans/pubs that have historical value will be clearly marked as such so outdated material will not be taken as current best practice. The extension leader in charge of this revision.	Fall 2012 – Fall 2013 Ongoing
Office staff taking calls from agents and clientele often struggle to provide the right resources requested or find the best person for referral within the department. Office staff need a clear plan for referrals.	E	A	Our departmental goal is accurate, timely customer service. To that end, the office staff need to have regular refresher sessions on who is handling each type of extension questions.	The department chair will work with the extension faculty members to develop a flow chart detailing who will be handling each type of extension question. The flowchart will be updated each semester.	Spring 2013 Review at start of each semester
Extension publication rates appear a little low, but records may not reflect collaborations with other departments that results in articles included in inter-department publications. Efforts should be made to fully recognize collaborative publication efforts with other departments and to convey this to administrations.	I/E	A	The BAE discipline is conducive to collaboration, and the department strongly encourages our engineers to work with others within the College of Ag and elsewhere to solve "real" problems. Our goal is to be recognized for our ability to collaborate, and to function on our own when appropriate.	The extension database is not collaborator-friendly; therefore our department must keep track of any extension publications on which our faculty members are authors. The extension associate senior will be tasked with keeping such a database.	Spring 2013 and ongoing
Faculty in disciplines with little funding may need to explore options and collaboration with industry as possible sources of funding.	I/E	A	The objective of this suggestion is for every faculty person to have sufficient money available to conduct an active research program.	During performance reviews, discuss funding for research program. Assist scientists brainstorming on potential funding sources. Hold scientists accountable for following up with potential funding sources.	Spring 2013 Spring 2013 December 2013 – December 2014
The department needs to push publication as a visible way of documenting activity. The department should send a consistent message to graduate students	I/E	A	Our goal is for every active scientist (faculty/staff/student) to contribute at least 2 papers per year to the department (one per year for newer graduate students).	During evaluations ask for 2013-2014-2015 goals. Hold people accountable for the goals they set.	Spring 2013 December 2013 –

regarding publication of their work and explore a publishing incentive program like that used by Entomology as long as funding sources are available.				Continue to reward graduate students with money for publishing.	December 2014 Ongoing
A review process equal to that used for numbered publications should be established and promoted to departmental performance review committees, as well as college administrations, so that credit is given for scholarly activities. The department should set the tone for the level of review needed for various forms of scholarly activities, especially those that are conducted in a non-traditional manner.	E	A	For those faculty members who produce scholarly work in an unconventional format, our objective is to have a method to fairly evaluate the product and include this effort appropriately in their performance review.	Extension coordinator – list scholarly products Devise review strategy for these items. Review and rate items. Include in performance review. Evaluate the process and iterate.	Fall 2013 Spring 2014 Summer 2014 Fall 2014 Spring 21015
IT services should look at tools that will allow impact assessment of digital resources. With resources limited, new digital ways of reaching appropriate audiences should be explored.	E	A	Our objective is to track the hits to our web site and pages, using something like Google analytics, and to tie this information into performance appraisal and quality improvement.	Hire new web/distance learning staff person. Evaluate traffic statistics that have been collected. Devise quality improvement plan.	Spring 2013 Summer 2013 Fall 2013
Movement of equipment needs to be monitored to reduce inventory burden. All faculty and staff are encouraged to keep inventory requirements in mind to reduce current problems locating equipment and computers.	I/E	A	Our goal is to have an accurate database of our capital and departmental equipment (estimated from $500-$2,000), complete with a photograph and location for each item.	November 2012 inventory went much more smoothly than November 2011 inventory, thanks to the database developed and populated by Alex Fogle with Julie Tolliver's assistance. The faculty and staff were educated about inventory protocol, and we will do this annually for new employees.	November 2011 – November 2012 August 2013
Labs should be maintained in a presentable manner (while maintaining consideration for the need to be productive), so that they serve as a safe environment and are not a detriment to student recruitment.	I/E	A	Our goal is to have productive, safe, orderly laboratories. We will save samples until the data are published or for 5 years, whichever comes first. Apparatii that have not been used for the past year or more will go to long-term storage, and be disposed of if not used within 5 years.	Alex Fogle initiated a major clean-up of the labs in August 2012 with the intent of eliminating items that have not been used in the last 5 years. Labs will be reviewed annually for accumulated clutter, and these areas will be cleaned up appropriately.	August 2012 Annually
The age and condition of some equipment is a concern and communications with the Federal Excess Property Program should be	E	A	Our goal is to have a safe, well-maintained machine shop that is capable of performing the required tasks for our faculty and students.	Prioritized list of maintenance needs, prioritized list of replacement needs, communicate with FEPP to be in a position to acquire needed	May 2013

considered as a possible means to acquire affordable equipment, especially fabrication equipment.				equipment as it becomes available.	
Distance between colleges is an issue for students, but some BAE faculty hold their classes in the College of Engineering to reduce stress on students.	E	A	Our goal is to have students' course schedules such that they are only required to commute to the BAE building once per day. This can be accomplished by either beginning their day at CEB with then the remainder of their classes on Main campus, or vice versa.	Equip first year and transfer students with the bus schedule. Continue working on a schedule for BAE classes that eliminates the need for students to travel back and forth multiple times per day.	August 2013 Spring/Fall 2013
Some courses might be remotely broadcast so students don't have to cross campus.	E	R	Remotely broadcast would not be practical because we do not have the facilities to do that. We are working on putting more classes on-line which would accomplish the same thing.		

*** Source of Recommendation (I = Internal recommendation; E = External Review Committee recommendation; H = Unit Head recommendation)**
**** Accept/Reject Recommendation (A=Accept; R=Reject)**

Unit Head Signature: _____ **Unit Head Supervisor Signature:** _____ **Date:** _____

Department of Biosystems and Agricultural Engineering Periodic Review

University of Kentucky
College of Agriculture, Food and Environment

Periodic Program Review Committee Report
February 2018

Prepared by

Kathryn Gray, Wes Harrison (Chair), David Jones, Karin Pekarchik, Michael Sama, Suzanne Weaver Smith, Brandon Sears, Joe Stevens and Mary Leigh Wolfe

Introduction and Review Process

Every academic unit at the University of Kentucky is required to undergo a program review at 5- to 7-year intervals. The Biosystems and Agricultural Engineering (BAE) Department in the College of Agriculture, Food and Environment underwent review in January 2018. The review was composed of a self-study prepared by the BAE faculty and department Chair, followed by a separate review conducted by a review committee. The committee's charge was to provide the unit (BAE) with additional perspectives and evaluation of the quality and effectiveness of the unit's programs. The committee members were internal and external to the department, college, and university (Table 1).

Table 1. Biosystems and Agricultural Engineering 2018 Periodic Review Committee Membership

Internal Members, University of Kentucky	
Wes Harrison, Chair	Professor and Chair, Department of Community and Leadership Development (CLD), University of Kentucky
Karin Pekarchik	Senior Extension Associate for Distance Learning, BAE, University of Kentucky
Michael Sama	Assistant Professor of Machine Systems Automation Engineering, BAE, University of Kentucky
Brandon Sears	Cooperative Extension Agricultural and Natural Resources Agent (Madison County), University of Kentucky
Suzanne Weaver Smith	Donald and Gertrude Lester Professor of Mechanical Engineering, College of Engineering, University of Kentucky
Joe Stevens	Graduate Research Assistant, BAE, University of Kentucky
External Members	
Kathryn Gray	Quality Engineer Supervisor, ALTEC, Elizabethtown, KY
David Jones	Interim Department Head, Biological Systems Engineering, University of Nebraska-Lincoln
Mary Leigh Wolfe	Professor and Head of Biological Systems Engineering, College of Agriculture and Life Sciences and College of Engineering, Virginia Tech

Over a two-day period, the review committee met with faculty, staff, students, stakeholders, and administrators of BAE to identify strengths, weaknesses or threats, and opportunities. The agenda is attached as Appendix 1. An Extension Agent Survey supplemented the meetings. This report summarizes the discussions and offers recommendations for the department and administration to consider. The results of the review committee's interviews are assembled as follows: strengths, weaknesses, opportunities and threats, followed by the review committee's recommendations.

SWOT Discussion

Culture and mentoring

The department's culture of cross discipline support and involvement is unique and should be celebrated. Several members of the review committee felt that the unit's culture and "thinking" are very similar to what happens in industry settings. BAE has a culture of attention to individual professional development and growth. Undergraduates described the department as being a "family." This culture is a strength within the department and has contributed to the collegial atmosphere that was expressed by undergraduate, graduate, faculty, and staff members. This positive atmosphere and culture enhances productivity, which then positively influences adaptability, which has been identified as a critical component to success.

There are potential threats to this culture: the common engineering first year (in the College of Engineering and in which BAE students participate), a potential biomedical engineering undergraduate program at UK, the influx of new faculty, and the transition in departmental leadership. It is important to not assume that the culture will promulgate on its own. Mentoring, done properly, should acclimate people to accept and adjust to change, and mentoring can enhance that rate of change. Flexibility needs to be a core principle that mentoring can encourage to react to these inward and outward pressures.

Faculty

The department has seen a significant shift in the distribution of faculty ranks in the past several years. Presently, 7 of the 19 faculty members, 37%, are assistant professors. The influx of new faculty has brought new energy and increased overall productivity. The faculty as a whole is a strength of the department.

Facilities

The labs and physical space are strong assets for the department, but no single person has a sense of the total operation. Resources could be shared across labs and space utilized more effectively. Workplace organization methods (5S, red tag campaigns, preventative maintenance) could be

utilized to make the labs a showpiece and give students exposure to industry standards. The True Lean Program could be of assistance here.

The BAE department is uniquely self-sufficient for most fabrication needs due to the Agricultural Machinery Research Lab (AMRL). The AMRL is an excellent resource for both faculty and students. Students gain hands-on experience and faculty have full prototyping capabilities. The equipment suite is extremely flexible, although dated. With experienced technicians close to retirement, backfilling their positions will be difficult due to comparable industry salaries and the available technology; the machining industry has shifted from manual operation to CNC programming. Understanding the true manufacturing capabilities of equipment would identify opportunities for capital equipment investment.

Linkages to College of Engineering

The links with the College of Engineering (COE) are also seen as strengths. Academic ties to a good college of engineering enhances the credibility and credentialing of the undergraduate program and provides opportunities for collaboration across colleges. However, connections with COE are complicated: undergraduate students are in Engineering, graduate students are in the Graduate School, while the staff and faculty are in the College of Agriculture, Food and Environment.

Student Programs

Student programs are characterized by the quality of undergraduate students and a “family atmosphere” with an excellent culture of inclusion and helpfulness. Teamwork and comradery among students are excellent, thanks to inclusive groups/clubs such as quarter-scale tractor pulling team. The department offers many diverse tracks of study — graduates can explore other post-graduate options such as veterinary or medical school. Professors are very accessible, helpful, and involved with student-led activities. Student enrollment is strong and is diverse in terms of race and gender. Financial incentives for graduate students to seek publication in refereed journals is a great program.

Extension Program

The BAE Extension program has a strong faculty, including new faculty members. Staff support is available for developing media such as podcast and websites. The large number of new agents hired over the past ten years provides a need and an opportunity to better educate agents about “engineering” questions and the expertise available from BAE Extension. Strengthening the relationship of BAE Extension with personnel across the state would increase the impact of BAE Extension programming. A variety of modes of programming and training, such as in-person, webinars, and on-line publications, could be used.

Recommendations

We propose for consideration by the College administration and the BAE department faculty and staff:

1. Develop a portfolio approach to balance the department's efforts across all missions – research, instruction, and extension.

Background: The BAE self-study requested that the review committee address the balance between the pursuit of grant dollars, refereed journal publications, extension publications, and student numbers to maintain a productive, well-rounded department.

Suggested Strategies:

- Develop a portfolio of goals to balance research, instructional, and extension efforts at the departmental level.
- Recognize that faculty and staff have different strengths and roles in contributing to the departmental portfolio.
- Review and align faculty distribution of effort (DOE) and place appropriate weights on each faculty member's contribution to the goals of the department.
- Place appropriate expectations on Extension faculty, and reward Extension efforts in contributing to the goals of the department.

2. Develop strategies to preserve the collaborative and cooperative culture of the department.

Background: The collegial community/family culture of the department is very strong among students and faculty. It would be worthwhile to understand what has contributed to this and maintained it through the recent growth so that it can be sustained as the department further grows and evolves. Faculty interest in and participation with student organizations, along with the shared fellowship of the daily casual "brown bag" student/faculty lunch (except Fridays), were mentioned as contributing to the collegial culture.

Suggested Strategies:

- Before developing a mentoring program or other action plans, consult with focus groups of alumni, students, staff, and faculty to understand key contributing factors to BAE's effective collaboration and collegial culture.
- Develop a multi-faceted action plan to nurture the department's distinctive and enabling collaborative and collegial culture.

3. Evaluate staffing needs (technical, professional, and administrative) and ensure that assignment of personnel matches needs.

Background: The BAE Department has a number of very talented staff who support student and research efforts. Creativity, flexibility, and diversity exist among the staff capabilities, and are needed to support the multidisciplinary nature and breadth of the research in the department. The need to support diverse and multidisciplinary program creates challenges to staff uniformity and staff supervision. The review team detected some concern among staff and faculty with respect to any plans to centralize staff responsibilities. Consequently, the notable collegial community culture among faculty and students does not seem to fully extend to staff. This may also be associated with ongoing budget uncertainties driving changes in university policies/procedures and worries about job security.

Suggested Strategies:

- Involve appropriate staff representation in evaluating staffing needs and responsibilities.
- Find a solution to replace lost capability due to the planned retirement of the lead machinist in the AMRL.
- Involve staff representatives in planning for new/moved shop facilities and new educational building features.

4. Proactively develop and implement a departmental laboratory operations and maintenance plan for all labs.

Background: The BAE department laboratory facilities in Barnhart are in need of updating. An electrical upgrade is needed to make much of the space more useable. In addition, plumbing needs to be updated, and renovation of the cabinetry layout in some of the labs would facilitate better use of the space for current research priorities, as well as for flexibility in the future.

Suggested Strategies:

- Include a management structure and processes for:
    - allocating space, equipment, and staff personnel
    - ongoing maintenance and upgrade of facilities, including individual lab spaces and overall facility
    - maintenance of equipment
    - replacement and acquisition of new equipment.
- Develop a plan/strategy for the replacement/relocation of the AMRL.
- Apply workplace organization methods to ensure safe, organized facilities.

Include specific plans for individual laboratories. Include timelines for processes and for updating the plans. The processes should include a needs assessment driven by the faculty.

5. Develop coursework and timeline to match PhD deliverables.

Background: Graduate program policies give three years as the maximum time to complete a PhD, but require 60 hours of coursework, along with three research publications. The timeline includes qualifying exams/proposal in the fourth term. These requirements and the time constraint seem incompatible. Experimental dissertations may typically require four years.

Suggested Strategies:

- Benchmark comparable programs with the intent of determining best practices and expanding the paradigm of how graduate programs can be offered.
- Consider offering a dedicated course(s) for graduate training supporting literature review, experimental design, grant writing, and journal publication.
- Reduce the PhD course requirement to be consistent with benchmarks, timeline, and publishing requirements.
- Develop training opportunities to provide an academic foundation for PhD students interested in academic career paths. Suggestions included helping tutor upper division students (which was a need expressed by undergraduates) and helping with research proposal writing.

6. Be proactive and build a strong relationship with the new Dean of the College of Engineering, and continue to collaborate at all levels to the benefit of both colleges.

Background: Connections with the College of Engineering are complicated: undergraduate students are in Engineering, graduate students are in the Graduate School, while the department and faculty are in the College of Agriculture, Food, and Environment. Research collaborations between faculty in BAE and the College of Engineering's departments of Chemical, Civil, and Mechanical Engineering have led to considerable success in attracting larger multi-investigator, multi-disciplinary sponsored research projects. Engineering recruitment efforts contributed to the recent growth of department enrollment; service courses in Mechanical Engineering, Civil Engineering, and Electrical and Computer Engineering contribute to curriculum. Collaborations among faculty, staff and students are numerous and beneficial, but more can be done to strengthen communications and cooperation between BAE and the College of Engineering. Several BAE courses would be of interest as technical electives for engineering students such as the Technical Systems Management (TSM) minor courses, among others.

Suggested strategies:

- Reconcile BAE planning with the College of Engineering growth plans.
- Undertake a larger multi-college initiative to build on the foundation of multi-investigator, multidisciplinary research.
- Encourage department-level relationships (possibly with committee representation, where appropriate) and more frequent dialog among department faculty and staff.
- Review course offerings, including those of the TSM minor, with the College of Engineering, and develop a list of courses that other disciplines could take in BAE as additional technical elective options.

7. Recognize the importance of Extension with DOEs that promote faculty excellence in extension by allowing appropriate time on their major appointment.

Background: Integrated research and extension programs are a common expectation of extension specialists. Currently, in addition, all extension faculty are also teaching courses in the academic program, resulting in a DOE that often does not promote faculty excellence in extension. A three-way split in effort often does not allow for appropriate effort to excel in each of the three missions.

Suggested Strategies:

- Develop a program around extension faculty area of expertise that addresses outreach opportunities, and focus accountability by telling success stories that emphasize impact rather than counting contacts or outputs.
- Revisit the BAE Statement on Evidences of Scholarly Activity in extension to ensure it matches what is desired, or convey those expectations to recently hired junior extension faculty.
- Collect quantitative/qualitative metrics from clientele, and identify the socio-economic impact of extension work.

8. BAE branding should focus on the unique systems approach and benefits for addressing complex challenges today in industry careers, research, and extension.

Background: BAE graduates, researchers, and extension specialists add value because their systems perspective enables them to perceive key underlying factors and interfaces, and to make critical timely decisions, affecting and benefitting the performance of complex systems. Strong students, with high ACT and higher education success index scores, and with a diversity of interests and career goals are attracted to BAE. Experiential education opportunities are available throughout the program, including ¼-scale tractor, industry internships, and departmental

undergraduate research. The instrumentation course, with its clever diverse projects, is a highlight for students, faculty, and alumni, and will benefit employers.

Suggested Strategies:

- Develop benchmark comparisons to other programs including Biological Systems or Biosystems Engineering at other universities, UK College of Engineering, and UK College of Agriculture, Food and Environment so that unique benefits are recognized and can be effectively communicated.
- Adapt essential ideas of the new BAE discipline graphic to become a focus for communications so that the department can speak with "one voice" about the multidisciplinary perspective of the discipline and "going the extra mile" work ethic.
- Effectively communicate the differences between Biosystems Engineering and Biomedical Engineering in the First Year Engineering (FYE) program so that recruiting and retention will be well-served for both programs.
- Ensure that the successful aspects of BAE 103, the pre-FYE problem-solving course, are sufficiently and effectively incorporated in the UK FYE program.

9. Consider developing a marketing/communication plan to address the potential impacts of a bachelors degree in Biomedical Engineering.

Background: The review team learned about preliminary discussions by the Department of Biomedical Engineering (BME) at the University of Kentucky to propose an undergraduate degree program in Biomedical Engineering. If a new program were to be established, this may impact student enrollment, and the number of students majoring in Biosystems and Ag, Engineering.

Suggested Strategies:

- Develop a plan to effectively communicate the differences between Biosystems Engineering and Biomedical Engineering in the First-Year Engineering (FYE) program so that recruiting and retention will be well-served for both programs.
- Review course offerings, including those of the TSM minor, with Engineering, and develop a list of courses that other disciplines could take in BAE as additional technical elective options.

10. Work with college to increase BAE alumni relations and development funds.

Background: The collegial community/family culture of the department is very strong among students and faculty. This is also a great foundation for building alumni engagement for the

upcoming capital campaign – even though the numbers of alumni are limited compared to the College of Agriculture, Food and Environment as a whole (UK CAFE Director of Philanthropy Pamela Gray estimated ~800 total including graduate program alumni); several alums are industry leaders.

Suggested Strategies:

- Fully utilize CAFE's Office of Philanthropy & Alumni to design an alumni and development plan for the department.
- Leverage the unit's success with the American Society of Agricultural and Biosystems Engineers (ASABE) International ¼-Scale Tractor Student Design Competition and Wildcat Pulling Team for fund raising.
- Establish relationships for student work experience and design project sponsorship.

College of Agriculture, Food and Environment
Department of Biosystems and Agricultural Engineering
Periodic Program Review
Site Visit Agenda
January 22-24, 2018

Date:	January 22, 2018
Day 1:	Monday

12:00 – 5:30 pm	Dr. Wolfe, Mr. Sears, and Ms. Gray drive to Lexington by personal vehicle and check in to Campbell House Inn.
5:30 pm	Dr. Jones arrives at Bluegrass Airport at 5:30 PM Dr. Harrison picks up Dr. Jones at Bluegrass Airport and transports to Campbell House Inn.
6:30 – 8:00 pm	Review Committee has dinner and working session at Campbell House Inn. Group is joined by Department Chair Dr. Mike Montross.

Date:	January 23, 2018
Day 2:	Tuesday

7:30 – 8:00 am	Dr. Harrison transports external guests from Campbell House Inn to E.S. Good Barn
8:00 – 9:00 am	Committee working breakfast, E.S. Good Barn, Weldon Suite
9:00 – 10:00 am	Meet with College of Agriculture, Food and Environment Associate Dean Workman. Committee receives their charge from Dr. Workman and reviews rules and procedures. E.S. Good Barn, Weldon Suite
10:00 – 10:15 am	Break and walk to department
10:15 – 12:00 pm	Meet Dr. Montross, department chair, in the Barnhart Building lobby for a departmental labs and shops tour. Dr. Montross provides vehicles for committee transportation.
12:00 – 1:00 pm	Lunch with departmental undergraduate students, E.S. Good Barn, Weldon Suite
1:00 – 2:00 pm	Meet with Associate Deans in E.S. Good Barn, Weldon Suite Dr. Rick Bennett, Research Dr. Larry Grabau, Instruction Dr. Gary Palmer, Extension Dr. Steve Workman, Administration
2:00 – 2:30 pm	Meet with college CFO Stephen Sizemore, college business analyst April Lyons, and departmental business officer Julie Tolliver, E.S. Good Barn, Weldon Suite
2:30 – 3:30 pm	Meet with departmental teaching and research faculty, E.S. Good Barn, Weldon Suite (extension faculty may also attend)

3:30 – 3:45 pm	Break
3:45 – 4:45 pm	Meet with departmental graduate students, E.S. Good Barn, Weldon Suite
4:45 – 5:15 pm	Meet with Senior Director of Philanthropy, Pamela Gray. E.S. Good Barn, Weldon Suite
5:15 – 6:30 pm	Dinner and meeting with departmental advisory board, E.S. Good Barn, Weldon Suite
6:30 – 7:30 pm	Working session for review committee members, E.S. Good Barn, Weldon Suite
7:30 pm	Designated local committee member transports hotel guests to Campbell House Inn.

Date:	January 24, 2018
Day 3:	Wednesday

7:30 – 8:00 am	Dr. Wolfe, Mr. Sears, and Ms. Gray check out of Campbell House Inn and travel to E.S. Good Barn by personal vehicle (Dr. Jones will ride with a designated committee member).
8:00 – 9:00 am	Working breakfast for review committee, E.S. Good Barn, Weldon Suite
9:00 – 10:00 am	Meet with departmental staff, E.S. Good Barn, Weldon Suite
10:00 – 11:00 am	Departmental extension faculty and other faculty not available for prior faculty meeting, E.S. Good Barn, Weldon Suite
11:00 am–12:00 pm	Video conference meeting with agriculture and natural resources extension agents, E.S. Good Barn, Weldon Suite
12:00 – 12:15 pm	Break
12:15 – 4:00 pm	Lunch and committee working session, E.S. Good Barn, Weldon Suite
4:00 – 5:00 pm	Committee presents preliminary recommendations to the Dean and Associate Deans, E.S. Good Barn, Weldon Suite
5:00 pm	Dr. Harrison transports Dr. Jones to Campbell House Inn

Date:	January 25, 2018
Day 4:	Thursday

9:00 AM	Dr. Harrison transports Dr. Jones from Campbell House Inn to Bluegrass Airport for 10:45 AM departure.

UK Program Review Implementation Plan

*This **required** form is described as Appendix A in AR II-I.0.6.*

College/Unit : Biosystems and Agricultural Engineering **Date: 3/25/2019**

Recommendation/ Suggestion	Source I/E/H*	Accept/ Reject**	Unit Response (resulting goal or objective)	Actions (including needed resources)	Time Line
1. Develop a portfolio approach to balance the department's efforts across all missions – research, instruction, and extension.	E	A	Our department has long recognized the varied contributions from faculty and staff. Funding, students, teaching, and publications (extension, journal articles, and other forms) ebb and flow over time for individuals, but overall the department needs to meet expectations within the College. We have general guidelines for the number of refereed journal articles, but lack clear metrics for grant funding, student numbers (undergraduate and graduate), extension contacts, extension articles and other activities. The work performed by extension faculty may not be clear to regular track faculty. Scholarly work from extension faculty could have higher impact and visibility compared to journal articles. This is not always clear or understood by regular title faculty. DOE guidelines are set by the College. They are adjusted based on consultation between the faculty member and chair.	Develop a consensus through a series of faculty meetings on goals for the overall productivity of the department. These are obviously tied to individual goals since the department productivity is the sum of the individuals. The target is the department in the top 20% within the CAFE statistical reports. Traditional numbered extension publications are easy to evaluate relative to journal articles. Processes may be needed to ensure non-traditional publications are reviewed to meet the definition of scholarly activity and match the department Statement on Evidences. This process will continue as is.	24 months
2. Develop strategies to preserve the collaborative and cooperative culture of the department.	E	A	Faculty, staff, and students work collaboratively within the department.	Chair (or committee) will meet with faculty, staff, and students to understand key factors in collaboration. A monthly email newsletter is sent to all faculty, staff, and graduate students. Other activities will be considered to develop further collaborations.	18 months

3. Evaluate staffing needs (technical, professional, and administrative) and ensure that assignment of personnel matches needs.	E	A	Our goal is to use staff resources efficiently. Three managers oversee the operation of the Agricultural Machinery Research Laboratory (AMRL or shop), wet labs, and dry labs and report to the chair. An administrative coordinator oversees the business function and office staff. The functions in the Barnhart Building and AMRL are well run.	Increase staff participation in the College staff development initiatives.	Sept 2018
			The manager of the AMRL has resigned and a replacement is expected to be hired August 2018.	Refill shop manager position. Search committee has faculty, staff, and graduate student involvement.	August 2018
			The work at the AMRL has changed with new faculty hiring. Less faculty effort is devoted to traditional machine design and fabrication, the staffing needs will need to evolve with changing research, extension, and teaching needs of the faculty.	Staffing needs at the AMRL will be addressed as part of the strategy for replacement/relocation. An experienced machinist will retire, and those skills might be addressed using computer controlled equipment.	2 years

4. Proactively develop and implement a departmental laboratory operations and maintenance plan for all labs.	E	A	As the building approaches 30 years of age, infrastructure upgrades and modernizations need to occur. The wet labs need updated bench space, plumbing, and electrical systems. Equipment maintenance/replacement is an on-going issue. Service contracts are used where feasible. Most of the building has dry lab space that is not as conducive to wet laboratory processes that are currently heavily utilized. Replacement/relocation of AMRL could have a signficiant impact. The department and other units within the college heavily use the AMRL.	The building and facilities committee, with additional input from the department, will develop a prioritized list of upgrades and modernizations that are needed. Funding sources will be identified from the college, philanthropy, and grants. Evaluate opportunities to share equipment with other departments. The chair will continue to work with faculty to ensure that adequate space and resources are available to perform high quality research. Survey faculty on what facilities and equipment are missing. Work with the departmental building and facilities committee to redefine laboratory space to meet future faculty/student needs. The chair will work with a faculty committee to perform initial estimates of space and equipment needs of a new facility. We will reach out to alumni and other constituents to develop estimates of space requirements and costs.	List within 1 year, secure funding 1-10 years 1-5 years 2 years
5. Develop coursework and timeline to match PhD deliverables.	E	A	Department needs to have a consistent message to PhD students on coursework, credit, and publication expectations. We have a required seminar course series to cover literature review, grant writing, and experimental design that could be strengthened.	Summer faculty meeting to evaluate credit hour requirements and entrance requirements. Define requirements and formalize with graduate school. Update the graduate student handbook to clarify degree requirements. Improve effectiveness of seminar course series related to literature review, experimental design, grant writing, and publications.	Summer 2019 Fall 2019 24 months

6. Be proactive and build a strong relationship with the new Dean of the College of Engineering, and continue to collaborate at all levels to the benefit of both colleges.	E	A	The Department Chair has traditionally attended both colleges' administrative meetings. There is overlap with potential technology programs in both colleges, as well as numerous opportunities for research and extension collaborations. The College of Engineering is evaluating an ABET accredited Engineering Technology program. This is very similar to the TSM program that was proposed previously by our department. This could have a major impact on our department.	Provide information concerning CAFE and BAE goals and priorities to new COE Dean, highlighting areas of commonality. The Associate Dean for Instruction in CAFE is participating in the discussion. This could be an opportunity to create an agriculture technology degree, but it could also distract from our departments research and teaching responsibilities in CAFE. Quarterly meetings will be held with the Dean to keep her up to date on status and priorities.	12 months 24 months
7. Recognize the importance of Extension with DOEs that promote faculty excellence in extension by allowing appropriate time on their major appointment.	E	A	Most of our Extension faculty have wanted to teach. This aids in attracting students (undergraduate and graduate) and helps keep their skills up to date. We are unaware of Extension activities that are not being performed due to teaching or research commitments.	Review Statement on Evidences and develop approximate outputs for all faculty. This includes scholarly activity expectations, teaching, grant funding, and service contributions. Appropriately document and credit Extension faculty who develop scholarly activity using non-traditional media. Scholarly activity in refereed journal articles is clear, additional processes may be required for peer review of non-traditional scholarly activity performed by extension faculty. This will be in the form of review procedures for non-traditional scholarly activity. Work with Extension faculty to improve documentation of quantitative / qualitative metrics related to their programs. Documentation of metrics is provided through a variety of sources including Digital Measures, annual performance reviews, and Kentucky Extension Reporting System (KERS).	12 months 12 months 24 months

8. BAE branding should focus on the unique systems approach and benefits for addressing complex challenges today in industry careers, research, and extension.	E	A	This is a persistent issue for all departments similar to ours. Items 8 and 9 are interrelated. We need to improve our message to prospective students and employers.	Develop a simple, clear, and consistent message on what Biosystems Engineering is. Make sure it highlights the differences between our program and others (especially Biomedical Engineering). Obtain feedback from current employers on strengths of our graduates and how we could use that to help current/future students. Work with CAFE Center for Student Success and College of Engineering Career Development office to improve Biosystems Engineering visibility among potential employers. Consult with First-Year Engineering (FYE) lecturers and determine what appeals to first-year students. Determine the most common times at which students decide on a program (i.e. before they arrive on campus or during information sessions in FYE program) and evaluate options for marketing based on the results. Implement a plan to target incoming students, transfer students, or FYE students as appropriate.	12 months 12 months 12 months 6 months 12 months 24 months
9. Consider developing a marketing/communication plan to address the potential impacts of a bachelor's degree in Biomedical Engineering.	E	R	This was combined with item #8.		

10. Work with the college to increase BAE alumni relations and development funds.	E	A	The College has significantly reworked the Office of Philanthropy and Alumni. A BAE staff member, Karin Pekarchik, has started working with the Philanthropy office on newsletters, email marketing and scholarship opportunities.	Work with faculty to develop a plan defining the resources and projects needed to attract potential donors. Likely priorities would include the AMRL, teaching labs, scholarships, and senior design.	24 months

* **Source of Recommendation (I = Internal recommendation; E = External Review Committee recommendation; H = Unit Head recommendation)**

** **Accept/Reject Recommendation (A=Accept; R=Reject)**

Unit Head Signature: _____ **Unit Head Supervisor Signature:** Nancy M. Cox **Date:** 4.22.19