

Academic Department Periodic Review

Department of Plant Pathology

Self-Study Report



Abbreviations:

- PPA: Department of Plant Pathology
CAFE: College of Agriculture, Food and Environment
UK: University of Kentucky
PDDL: Plant Disease Diagnostic Laboratory
PSB: Plant Sciences Building on the Lexington campus of UK
UKREC: University of Kentucky Research and Education Center/Grain and Forage Center of Excellence at Princeton, KY.
MS: Master of Science
PhD: Doctor of Philosophy
RA: Research assistant
TA: Teaching assistant
DGS: Director of Graduate Studies
DUS: Director of Undergraduate Studies
DOE: Distribution of effort.
FTE: Full time equivalent
APPS: The Association of Plant Pathology Scholars
UFV: Universidade Federal de Viçosa, our partner institution in Brazil for the dual PhD degree program.
- Faculty title series:*
ETS: Extension title series, with emphasis on extension and applied research
RTS: Regular title series, with emphasis on research
STS: Special title series, with emphasis on instruction

I. OVERVIEW

College Mission Statement

The College of Agriculture, Food and Environment *serves the people* of the Commonwealth and across the world through education, outreach, service, and research by finding solutions to improve lives today and creating a sustainable future.

We do this by:

- educating current and future leaders
- producing and disseminating knowledge through creative research and discovery
- promoting lifelong learning and strengthening Kentucky communities through applied knowledge.

Department Mission Statement

The mission of the Department of Plant Pathology is fully aligned with the College and the University missions. We strive to conduct world-class research and education programs that support and promote plant health and sustainable agricultural productivity, while providing abundant, affordable, healthy food for the people of the Commonwealth and beyond. We work to provide Kentuckians with practical

research-based educational tools to improve their health and quality of life, and to increase profits for local agricultural producers while conserving our precious natural resources. We aim to provide an excellent comprehensive education for undergraduate, and graduate students, with a state-of-the-art curriculum that emphasizes experiential learning and critical thinking, preparing them to be productive citizens and leaders for the next generation as members of the private and public agricultural workforce.

Department Goals

Goal 1: Prepare Students for Leading Roles in an Innovation-driven Economy and Global Society.

While not awarding an undergraduate degree in Plant Pathology, the Department and its faculty contribute in major and impactful ways to undergraduate education at the University of Kentucky. For example, several faculty currently teach courses associated with well-supported undergraduate interdisciplinary programs (e.g. Hirsch, ABT 101, ABT 120, NRE 390, EXP 396; Farman, GEN 300; Bennett, ABT 301; A. Kachroo, ABT 395, P. Kachroo BIO199).

Additionally, faculty routinely mentor undergraduate student independent research projects in PPA 395, ABT 395, and ABT 396. These independent projects teach a variety of marketable skills that prepare students for employment in public or private research enterprises, or for entry into higher education programs. The PPA-prefixed undergraduate courses have an impact far beyond the department. PPA 300 is cross listed with the Lewis Honors College for Honors credit and PPA 400G serves as a major requirement for the interdisciplinary Agriculture Ecosystem Sciences major, while both serve as elective courses for several other majors in multiple colleges at UK. Furthermore, many of our faculty serve in important leadership and advisory roles in multiple undergraduate academic programs, in addition to serving as undergraduate academic advisors for students in the Agricultural and Medical Biotechnology Program.

Graduate training in well-funded, dynamic research and extension programs, allied with state-of-the-art studies of plant disease and infectious disease biology, will produce individuals who are motivated and ready to solve the most important problems that face our society. These include ensuring a safe and abundant food supply, protecting our environmental resources, and improving our economy and the health and livelihoods of Kentuckians and of the national and global community. By seeking to engage the very best students from around the world, representing a range of economic and cultural backgrounds, and providing an education that stresses critical thinking, social responsibility, and hands-on training in the most modern disciplinary approaches, the department strives to assure a talented cohort capable of serving in the vanguard of future plant protection scientists, educators, and practitioners in industry, government, and academic positions in Kentucky and beyond.

Objective 1: To recruit and retain high caliber graduate students from a diversity of backgrounds.

Objective 2: To provide a high-quality undergraduate and graduate education in plant pathology and biotechnology that emphasizes critical thinking, and cultural and environmental responsibility.

Goal 2: Promote Multidisciplinary, Problem-Focused Research and Creative Work that Increases the Intellectual, Social and Economic Capital of Kentucky and the World Beyond its Borders.

The Commonwealth is greatly advantaged by possessing, in the Department of Plant Pathology, a cohort of highly motivated and creative faculty and staff scientists addressing critical challenges related to infectious disease and microbial parasitism in plants. These scientists are focused on problems of specific importance to the state, as well as to the nation and the world

beyond. Through their activities they aim to develop innovative, timely, and environmentally sound management strategies that support the economic health of Kentucky agriculture, and provide an affordable, safe, and healthy food supply to improve the quality of life for Kentuckians and for the global community.

Objective 1: To support and engage in multidisciplinary research in the area of infectious disease biology and microbial parasitism of plants, to comprehend the complex interrelationships of plants and their pathogens and parasites with the goal of improved disease management through sustainable approaches.

Objective 2: To pursue applied research to provide state-of-the-art management recommendations for plant diseases in Kentucky, in order to improve economic outcomes for Kentucky farmers and food processors, and to increase the availability and safety of the food supply, including locally sourced foods and agricultural products, for Kentucky consumers.

Goal 3: Develop the Human and Physical Resources of the University to Support Work to Improve the Economic, Physical, and Social Well-being of Kentuckians.

Recruitment and retention of exceptional faculty and staff who are intelligent, creative, and motivated is the bedrock for success of any academic department. Department faculty are recognized nationally and globally as leaders and innovators in their fields, and they bring significant recognition and capital to the Commonwealth. The department also strives to fund, recruit and retain talented graduate students and postdoctoral and visiting researchers dedicated to the research, extension, and teaching missions.

Objective 1: To recruit and retain top-tier faculty, staff, students, postdoctoral scholars, and visiting scientists.

Objective 2: To build and equip state-of-the-art research facilities.

Objective 3: To develop our human resources through wellness initiatives, continuing education, and training programs.

Objective 4: To build new opportunities to reach out and connect with Kentuckians and the global community.

Recommendations and changes from most recent periodic review

The full set of recommendations from the previous Plant Pathology department review, and final implementation report are in (Appendix 1). Major recommendations that we were able to address substantially include: (4) Purchase a new set of growth chambers; (6) Develop a graduate student orientation program; (7) Promote an active social committee; (8) Promote travel to professional meetings for graduate students; (11) Encourage faculty to take sabbatical leaves; (14) Increase MS degree number. Additionally, successes and setbacks were experienced in efforts to maintain and enhance diversity at various levels (Recommendations 5 and 10). Importantly, we have had two Minority graduate students supported by Lyman T. Johnson scholarships and CAFE diversity funds. Also, Dr. Vaillancourt initiated a high school student internship program targeting minority students, several of whom have gone on to college.

The recommendation to increase MS degrees did not originate from previous the review committee but was added later to address a concern of the Kentucky Council on Postsecondary Education. The department members agreed to, and the DGS implemented, a non-thesis MS degree program as one mechanism to address that recommendation. Whether that new program will have the desired affect has yet to be seen because the pandemic and its economic consequence—a 9.5 % cut in the department’s state budget—has since confounded graduate student recruitment. Nevertheless, the recent trend has been for increasing numbers of MS students and degrees in the department.

Development of a 4+1 program to recruit talented students into the MS degree pathway while still pursuing the undergraduate degree also received consideration as an option for increasing graduate enrollment in the master's program. The department did not perceive a current demand for this particular option but will consider implementing one if that situation changes. Continued engagement with ABT and other undergraduate programs will help identify students for whom such an option may be appropriate.

The hoped-for increase in department faculty lines overall has not materialized. This pertains to recommendations 1, 2 and 3. Some changes in locations and responsibilities of department faculty lines have been notable and favorable in some ways. One is the hire of a Special Title Series (STS) faculty member whose primary responsibilities are Teaching, Administration of undergraduate degree programs (as DUS), and Outreach especially to K–12 schools. The other is the hire of two Extension Title Series (ETS) faculty to be located at UKREC in Princeton, KY. The result is increased presence of Plant Pathology extension and research in Western Kentucky at a time when land going into cultivation there has been increasing. It is also noteworthy that the new faculty hires have had startup packages substantially greater than was previously typical for ETS and STS hires but in keeping with current needs including vigorous applied research programs conducted by ETS faculty. Also noteworthy, most of the startup funds for the STS faculty hire (Hirsch) were used for a new set of teaching microscopes for our undergraduate/introductory course PPA 400G, a critical college need.

In addition to progress on most of the recommendations, the department has enjoyed considerable successes overall. The faculty are known nationally and internationally for their excellence as researchers and educators and have been in high demand and very active in service to the scientific community, stakeholders, students at all levels, and society at large. Indicators of productivity and recognition such as publications in appropriate and impactful venues, receipt of grants and gifts to support research, extension and other outreach activities, and invitations for collaboration and information exchange, have all been very positive. Recently, initiatives of PPA faculty spearheaded two major equipment grants—one for a super-resolution confocal microscope and the other a qTOF liquid chromatography-mass spectrometer—both of which serve as important resources for the college and university.

Areas that currently need addressing include the low faculty numbers (currently 12) and top-heavy demographic (almost all Full Professors). As we proposed in the previous review, additional Regular Title Series (RTS) faculty lines would help us better cover the breadth of the discipline of plant pathology in our research and educational programs, as well as to bring in new expertise and perspectives. Potential cluster hire proposals are under discussion (See Reflection section). Furthermore, the shift in location and emphasis of ETS faculty has left an important gap in commodity coverage that would best be filled by addition of a new ETS faculty line. Recommendations of the External Review Committee regarding succession planning and stakeholder input for new faculty hires are welcome.

The vibrancy and diversity of the Plant Pathology body of students and staff are also greatly enhanced by new faculty hires. Graduate student training has always been an important department activity on the Lexington campus, and in recent years has expanded considerably on the initiative of the two new Extension Professors in Princeton.

The recent death of Dr. Michael Goodin, an eminent plant virologist, left a gaping hole in the department in many ways including his many creative undergraduate and graduate enrichment activities, his scientific perspectives, his perspective as a Jamaican and Canadian, his humor and caring attitude, and his friendship. The department also experienced a blow both to diversity and capability when Dr. Emily Pfeufer, a very active and productive Assistant Extension Professor, left to take a job with USDA-ARS. These events occurred amidst the pandemic, which also forced deep cuts in staff funding.

The strengths of the department enhanced in many ways over the past six years, as well as the setbacks over that time, all highlight the importance to advocate for expanding the department, beginning with new faculty hires, to help ensure the breadth of function and institutional stability needed to serve the needs of the Commonwealth of Kentucky and the community of agricultural researchers and practitioners nationwide.

Self-Study process

The Chair informed the department of the upcoming External Review in a meeting of the faculty and department on Sept. 20, 2021 and circulated the self-study template at that time. In a department meeting on Nov. 29, the Chair went through the self-study template in detail and solicited information from the faculty and the other members of the department. The Chair drafted a self-study document and presented it to the department in a meeting on Jan. 24, 2022. The chair held a follow-up meeting on Feb. 7 to discuss the document further. Faculty provided additional feedback, including a fully annotated document over the following week, which was further refined by email exchanges. On Feb. 11, the Chair submitted a draft document to the CAFE Office of Faculty Resources, Planning and Assessment for initial review and feedback. Subsequent communications between that office, the Chair and the Department Faculty were employed to refine the document.

II. DEGREE PROGRAMS

The Department of Plant Pathology is fully engaged in educating both undergraduate and graduate students through several degree programs including, but not limited to, MS and Ph.D. degrees in Plant Pathology.

Department of Plant Pathology goals are closely aligned with those of the College and University around diversity, equity, and inclusion. We are committed to recruitment, retention, and professional development of the most diverse pool of talented graduate students possible, and we do not discriminate based on gender, race, ethnicity, national origin, or sexual orientation. Nevertheless, we have struggled to establish and maintain ethnic and racial diversity particularly among our domestic students. We have a relatively small student cohort, which is largely a reflection of our small faculty numbers and of limited funding opportunities beyond individual faculty grants for ever-increasing tuition and health insurance costs for the students. Many of our international students have most of their stipends paid through scholarships from their home countries, while the department budget for graduate student support has been shrinking. Traditionally we have not admitted students without providing them with funding, mostly in the form of research assistantships. We recently eliminated our admissions requirement for GRE scores, based on data that suggest that a GRE requirement can discriminate against economically disadvantaged students or students of color. We are tracking data to assess the implications for student diversity and success.

MS Program in Plant Pathology

a. Student and employer demand. Most students enter our MS program with the intention of receiving a terminal MS degree, reflecting the strong demand for this credential in the workforce. This demand is illustrated by the success of our MS recipients obtaining employment in line with their career goals in industry, government, and academic institutions. Notably of the eight most recent MS degree recipients in the program since 2015, six had Extension faculty as advisors or co-advisors. This reflects a strong demand for training in more applied aspects of the discipline. Our department provides an excellent educational foundation in both research and extension for these students, thus providing highly relevant job training for applied research positions.

b. Composition of student enrollment and recent graduates. The program has experienced a steady increase in demand for MS degrees, especially from domestic students. In the past six years, 10 out of

11 M.S. students have been domestic, and 36 % have been female. Of the domestic students 20% have self-identified as racial minority, and 20% are Hispanic. The most recent MS degree recipients included one in 2015 (a Fulbright-funded student from Indonesia), three in 2020 and four in 2021. Currently, there are three students enrolled in the MS program. Our goal is five MS degrees awarded annually (~5 recruits and 10 total enrolled annually) and, although the trend has been favorable, the pandemic and associated budget problems have delayed our progress in meeting this goal.

c. New non-thesis option for MS in Plant Pathology. We recently added a non-thesis Plant Pathology MS option (also called plan B). Under this option, the student completes required coursework and then takes a written or oral examination, in lieu of writing and defending a thesis. Because it is new, the option has been used just once so far. The Plan B option can be completed faster than the thesis-based MS, and is expected to provide excellent training for plant health practitioners for whom a research degree is not necessary. It can also serve as a path for continuing professional education for STEM teachers, helping to increase exposure of secondary school students to plant sciences and critical issues in plant health. Recommendations from the External Review Committee on recruitment of students into the Plant Pathology MS programs are welcome.

PhD Program

Student and employer demand. Students enter our Ph.D. program with a wide range of career goals and ultimately find employment in a variety of positions in industry, education, and government research and service (more details below).

Composition of student enrollment and recent graduates. The majority of our PhD students are international; of 27 PhD students in the past six years, six (all current) are domestic students. Current international PhD students include two from Brazil, six from China, and one from Japan. Among the 27 most recent PhD students, 15 (56 %) are female: currently enrolled students include eight women and seven men. Although many of our students do come from other countries, it is important to point out that a majority remain here in the U.S. once they complete their degrees. They are hired by U.S. companies and universities where they contribute significantly to our economy. Our student body is closely reflective of our applicant pool, which includes fewer domestic versus international applicants to our Ph.D. program.

Our department is committed to increasing the global footprint of our University and to raising the international profile of the Commonwealth. We developed a unique collaborative degree program with partners at the top ranked Federal University at Viçosa (UFV) in Brazil five years ago (Appendix 2). The program allows students to simultaneously earn a Ph.D. from the University of Kentucky and a Doctoral Degree in Plant Pathology from UFV. We have had one graduate of the program so far, and another is enrolled currently. Unfortunately travel restrictions due to the recent pandemic interrupted our ability to recruit students in 2020 and 2021. Our partnership with UFV provides a unique global perspective for our students via their participation in interdepartmental seminars, classes, and research projects with UFV faculty and students. For example, four of our students took a course in Plant Disease Epidemiology online in English from one of our colleagues at UFV for transfer credit during the spring of 2021. Note that both institutions manage application, approval, and enrollment independently and there is no guarantee of admission to either program as a result of admission to one of the programs. At UK, all program requirements for graduation are the same for students regardless of their pursuit of the single degree or of the degree at both institutions simultaneously.

	MS	PhD	Total
Total	8	12	20
Male	6	5	11
Female	2	7	9
Hispanic American	0	0	0
Non-Hispanic American	7	0	7
Minority American, traditionally under-represented	1	0	1
International	1	12	13

	MS	PhD	Total
Total	3	15	18
Male	1	7	8
Female	2	8	10
Hispanic American	2	0	2
Non-Hispanic American	1	6	7
Minority American, traditionally under-represented	1	0	1
International	0	9	9

Considering that two active Plant Pathology Extension faculty are now based in Princeton at the UK Research and Education Center (UKREC), we anticipate that the number of graduate students training there will expand. Lexington and Princeton faculty and students frequently conduct collaborative research projects, taking full advantage of the significant resources and expertise for field-based studies at the UKREC. Proximity to stakeholder groups (e.g. the Kentucky Soybean Board) is a significant benefit of the location of the UKREC in western Kentucky. Four current students (1 MS, 3 PhD) are based there. Unfortunately, the destruction of that facility by a tornado in December 2021 presents difficulties for those students to complete their degrees in a timely fashion and has probably compromised the potential to recruit new students at the UKREC for at least the next two years.

a. Teaching and Curriculum Administration

Undergraduate Teaching.

The Department of Plant Pathology is much more active in undergraduate teaching and mentoring than might be expected for a department with no formal undergraduate degree. Our faculty are heavily involved in administering and teaching the highly successful interdisciplinary undergraduate Agricultural and Medical Biotechnology (ABT, a.k.a. AMBI) degree program. This genetics-focused, research-intensive degree program has had an excellent track record of training students for jobs in the agricultural and medical biotechnology sectors, as well as in preparing students for successful professional careers in research, medicine, dentistry, and other related fields. With a focus on cutting edge biotechnological research approaches and technology, our faculty play an outsized role in programmatic leadership and research mentorship in the ABT 395 and EXP 396 independent research and internship courses. These courses provide direct experience and training in marketable research

skills and prepare students for careers in the public or private research sectors. Furthermore, a member of the PPA faculty (Hirsch) also administers the interdisciplinary Agriculture Individualized Curriculum program in CAFE that caters to non-traditional learners and students who need specialized courses of study, in addition to serving on policy- and curriculum-level bodies within the Lewis Honors College that serves over 2000 students at UK. The department regularly hosts several ABT interns for their required research components under the independent research course ABT 395, which is administered by one of our faculty, Aadra Kachroo.

b. *Curriculum development.*

We revised our core curricula for the MS and PhD programs several years ago to emphasize critical thinking and experiential learning, and to increase flexibility for students to allow them more individual latitude in preparing for their preferred career paths. Courses are taught or team-taught by faculty in their own specialties, updated frequently to include the most current information, and are generally ranked highly in student evaluations. Several courses are cross listed with other programs and departments. A continuing problem for some of our graduate courses is low enrollment due to our small number of PPA graduate students, which in turn is due to our small faculty cohort. In addition to the graduate curriculum, faculty in the department offer a variety of courses at the undergraduate level through numerous interdisciplinary programs that reach hundreds of students each semester.

Courses currently taught by Plant Pathology faculty are listed in Appendix 3. Courses at levels 500 and above count toward graduate credit hours and the graduate GPA. PPA400G counts as normal 400-level credit for undergraduates and graduate credit for graduate students outside of PPA. Courses with asterisks (*) are required in the MS and PhD programs.

c. *Student success measures and outcomes*

The department's two graduate programs, MS and PhD, provide program-level student learning outcomes (PSLOs) during our annual assessment cycle reported to the Office of Strategic Planning & Institutional Effectiveness. The PSLO assessment process seeks to provide evidence of student achievement and of actions taken by the faculty to improve student performance with respect to the stated learning outcomes. Students were assessed based on success measures which demonstrate that students must : 1) exhibit critical and reflective thinking and communication skills; 2) demonstrate fundamental understanding of both basic and applied methodologies used in plant pathology; 3) contribute to the body of scientific knowledge in plant pathology by reporting in a dissertation or scientific publications, and 4) conduct independent research at a holistic level such as plant protection strategies and a reductionist level such as molecular mechanisms. These success measures were chosen because they provide evidence of student achievement. Results for the 2020-2021 year indicate student performance was at or near the benchmark for all PSLOs assessed based on evaluations during qualifying exams, departmental seminars, thesis/dissertation, and final exit exam.

Times to degree: The average time to degree for all MS recipients from 2015 to 2021 was 3.1 years (n = 9). Removing one outlier, the range was 2.0–3.5 years. The outlier (at 5.5 years) is a student who opted to switch from PhD to MS.

Time to degree for all PhD recipients from 2015 to 2021 averaged 6.0 (n = 12). Removing one outlier, the range was 4.5–7.0 years. The outlier (at 2.5 years) is a dual degree student from UFV in Brazil who, in accordance with that program, completed most requirements at UFV before enrolling in the UK program.

Where our students have gone: Our graduate degrees have high value in the marketplace. Students receiving MS degrees from the Department consistently and quickly find employment in their desired occupations. Of our four most recent MS recipients, one went on to PhD elsewhere and is now back in our department as a postdoctoral scientist, two are research technicians at the University of Kentucky

(one in our department, and one in Forestry) and one is a Research Associate with AgroSpheres Inc. in Charlottesville, VA. Our PhD graduates also have been very successful in finding employment in our field: of our 11 most recent Ph.D. recipients, five have university faculty positions, one is a research team leader at Bayer Crop Science in Brazil, and five are employed as postdoctoral scientists (doing postdoctoral training after the Ph.D. is the norm in our discipline).

d. Delivery of instruction

Required graduate level courses currently total 10 credit hours (PPA 500, PPA 600, PPA 640, PPA 641, PPA 770), and at least two of the elective PPA graduate courses must also be taken. The department regularly offers the following elective courses PPA 609 (3 cr.) PPA 620 (3 cr.), PPA 650 (3 cr.), PPA 670 (1 cr.), PPA 671 (2 cr.) and PPA 673 (1 cr.), with two other 1-cr. courses (PPA 630 and PPA 631) on the books. The following are requirements for an M.S. at the University of Kentucky:

- 24 Credit hours of graduate level classes
- 12 of the 24 credits must be listed within the program (PPA)
- 12 of the 24 credits must be 600-700 level
- 16 of the 24 credits must be regular courses (PPA 768, PPA 784, and PPA 794 do not count)

Remote delivery of some courses. The Department of Plant Pathology has been a leader in remote learning and the development of online courses, particularly through the work of Paul Vincelli. Remote courses are accessible for off-campus staff and students, allowing us to expand our educational reach and workforce training mission. The recent pandemic has been another impetus for development of remote content. The department will be assessing which courses can include a formalized remote section to accommodate graduate students at Princeton and other remote students, which could include Extension Agents and students at UFV, our partner institution in Brazil.

The most challenging courses to teach remotely are those with associated laboratories. **PPA 400G**, Principles of Plant Pathology, primarily serves undergraduates, although most incoming graduate students in our department take it because they lack prior coursework in the discipline. **PPA 640**, Plant Disease Diagnosis, is required in the PPA MS and PhD programs and is very popular with our students and with students outside the department. Models for delivering laboratory materials and facilitating activities (labs and, for PPA 640, field trips) were developed and trialed during the pandemic and some of these could become part of a permanent remote section.

e. Student research and teaching assistantships.

Almost all PPA graduate students have research assistantships (RA). Some students opt for a 1-semester teaching assistantship (TA), which in recent years has been tied to ABT 120 (taught by Hirsch). Some international students receive scholarships from their home countries, but all of those must be supplemented to meet the current target support of \$22,000 annually plus fringe (mostly FICA), health benefits and tuition. The expectation of an RA is 20 hr/week of work, not including thesis/dissertation research. However, the boundary between that work and thesis research is usually indiscernible, and students and their advisors generally feel compelled to include any and all useful results in theses and any publications. Graduate students and postdoctoral scientists contribute substantially to the research productivity of the department and are essential for our research enterprise.

The average number of graduate students per faculty member has remained steady at between 1.50 and 1.85 over the past six years. Out of the current faculty, 6 out of 7 RTS and 3 out of 4 ETS faculty serve as major advisors to graduate students, all 12 faculty members in all three title series serve on Graduate Student Advisory Committees within the program, and most also serve on such committees in other programs.

III. FACULTY AND STAFF

a. Composition of faculty and staff

The faculty of the Department of Plant Pathology currently comprises 12 members. The University of Kentucky has several “title series” of tenure-track faculty. Seven of the Department faculty are Regular Title Series (RTS), expected to emphasize research. Four are Extension Title Series (ETS), expected to emphasize service (especially Extension) and applied research. One is Special Title Series (STS), expected to emphasize teaching. Although different title series entail different emphases, all faculty members engage in support of all three Land-Grant missions (Teaching, Research, and Extension/Service) on a regular basis. This is achieved by extensive collaborations among them across the three areas, strengthening the ability of the department to deliver relevant, research-based solutions to plant health challenges that are important for Kentuckians. See Appendices 4, 5, and 6 for details of Extension, Regular, and Special Title Series faculty focus areas. Over the past several years, our department has lost two funded RTS positions, and we currently have one vacant (but only partially funded) RTS line. This reduction in our already small faculty numbers has significantly impacted our ability to conduct our mission. It has reduced our ability to attract new graduate students, thus shrinking our graduate student cohort. It has left some important disciplinary areas and commodity groups uncovered. Furthermore, our current faculty consists almost entirely of full professors, whereas a more balanced demographic would be preferable for the long-term health of our Department.

Highly qualified professional staff are essential for all three of our mission areas (research, extension, and teaching). The department has 16 filled staff positions each funded to 75 % FTE by the College through the department budget after recent budget cuts. Four are office staff, two are plant disease diagnosticians, and 10 are technical staff. Six of the technical staff support our research mission within individual programs, and three support the extension faculty as a team. A greenhouse manager maintains critical plant material for several RTS and ETS faculty members.

Previously, staff were fully budgeted with most at 93.75 or 100 % FTE in the department budget. However, in 2020 a 9.5 % budget cut was mandated by the university and the college. Lacking vacancies at the time, the only option to meet the mandate was to cut staff hours. In the first year the university covered the difference. Currently the department is covering the difference for most staff from staff and faculty vacancies. In future, new technical staff hires in the established positions (if filled) will be funded only at 75% on the department budget with the remainder on soft money (usually grants or salary savings).

Currently there are four staff vacancies. Savings from those vacancies are now providing funding for between 15–25 % of the other staff. One of the vacancies is the Plant Disease Diagnostician based in Princeton, KY. Destruction of that laboratory by the December 2021 tornado complicates plans to fill that vacancy and to address the diagnostic needs of the state.

b. Deployment and workload of faculty and staff

Plant Pathology Attempted Credit Hours by Instructor AY2016 - 2022							
Instructor	Academic Year						Grand Total
	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	
Bennett				47	61	61	169
Bradley						2	2
Farman	16	19	33	31	15	4	118
Gauthier	3						3
Goodin	44	157	138	130	107		576
Hirsch	192	261	222	296	257	330	1558

Kachroo, A.	9	139	121	133	151	162	715
Kachroo, P.	14	4	9	12	26	18	83
Nagy	12	12	12	14	8	6	64
Pfeufer	2						2
Schardl	45	65	151	125	125	105	616
Vaillancourt	35	13	39	25	57	29	198
Vincelli	7	52	2		47	39	147
Wise						4	4
Grand Total	379	727	727	813	854	760	4260

FT Faculty FTE by Mission Area and year (derived from DOE)					
	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Teaching	1.52	1.75	1.9	2.05	2.47
Research	5.23	5.12	5.72	5.56	5.71
Service	4.43	5.18	5.06	4.42	4.69
Admin	0.83	0.98	1.33	1.23	0.98
Prof. Dev.	0	0	0	0.7	0.17
Total	12	13	14	14	14

See III a. above, for more information.

c. Faculty and staff success measures and outcomes

Staff are evaluated by their supervisors, who are the most appropriate faculty members for technical staff, the office manager for clerical staff, or the Plant Disease Diagnostician for her Diagnostic Aid. Each major job responsibility (MJR) is evaluated, and a summary score determined based on the score and percentage effort for each MJR. A set of core competencies is also evaluated, but those are not figured into the overall evaluation score. Staff are first given the opportunity to self-evaluate. Then the supervisors draft the evaluation and conduct individual meetings with their staff. The department's Resource Committee reviews the draft evaluations and gives feedback to the supervisors with the aim of ensuring fair and uniform standards across the department. The process is completed with signatures of the supervisor and the supervisee.

Faculty are evaluated in accord with the appropriate university regulations, as well as the Statement of Evidences documents of the college and the department. Faculty are evaluated every year if untenured, or every two years if tenured. The college-run process involves, for each faculty member, generation of their curriculum vitae in Digital Measures, and their submission of narratives for each DOE component, as well as a teaching portfolio whenever applicable. The department's Faculty Merit Review Committee, comprised of members elected from the tenured PPA faculty (with required biennial rotation), advises the chair on ratings and comments. The chair submits the evaluations through the web portal. Ultimately, final evaluation is conducted by the College Dean in consultation with Associate Deans, who meet with the Department Chair prior to finalizing the evaluations. An appeals process is available to the faculty.

Untenured faculty also undergo two-year and four-year evaluations conducted by their department chair.

Levels of faculty and staff pay increases typically depend upon the numerical evaluation scores, but specifics have varied depending on administrative policies.

For faculty promotion and tenure the candidate first submits to the department chair a curriculum vitae emphasizing the appropriate time frame, narratives for each DOE component, and 3–5 examples of scholarly products. The department chair solicits letters from outside experts (some identified by the candidate, some by the chair) who review those materials, and adds their letters to the dossier. The unit faculty of appropriate rank review the aforementioned material and letters, then provide letters to include in the dossier. The dossier is evaluated at the college level by the Promotion and Tenure Committee and the Dean, then by the appropriate Area Committee, and ultimately by the University Provost.

The PPA faculty are widely recognized for their scholarly contributions and their service to the scientific community, stakeholders and the public. They are regularly called upon to present at meetings, author publications, serve on editorial boards, serve on study panels for competitive federal grant panels, and collaborate on regional, national and international projects. Interestingly, although the PPA faculty members are classified in distinct title series such as RTS, ETS and STS, there is a very high degree of similarity in activities and strong collaborations between them. For example, while our ETS faculty emphasize outreach to producers (directly or via county agents), and support that outreach with research, there is no clear distinction between their “applied” research and “basic” research that may be the emphasis of RTS faculty. Indeed, joint projects and publications are common. What’s more, outreach to stakeholders often features in RTS faculty programs as well.

As mentioned above, most RTS and ETS faculty also serve as major advisors for graduate students, and all participate on advisory committees.

From 2016 through 2020 the number of refereed journal papers published by PPA faculty has ranged from 30-43 per year and averaged 34.6. This is in addition to book chapters, and other publications. All PPA graduate students who completed MS or PhD degrees in that time period have been co-authors, and most have been first authors on refereed publications (28 in all). Several undergraduate students have also co-authored peer reviewed papers from the department.

There are various measures of research impact, though none are considered definitive. One commonly cited measure is h-index. The following table lists the current h-indices and related metrics from Google Scholar.

*Publication citation metrics from Google Scholar for department faculty members with at least 20 % research DOE **

	Title Series	h-index	Citations	i10 index	h-index since 2017
Bradley	Extension	38	4761	105	31
Farman	Regular	38	11021	65	27
A. Kachroo	Regular	43	6260	62	30
P. Kachroo	Regular	48	9587	69	36
Nagy	Regular	64	11275	157	30
Schardl	Regular	70	17496	150	37
Vaillancourt	Regular	27	2991	39	15
Vincelli	Extension	24	2137	40	14
Wise	Extension	26	2544	54	25

*Bennett is new to a non-administrative faculty position and for this reason lacks a Google Scholar profile.

Over 20 years of research, an h-index of 20 is considered good, 40 is considered outstanding, and 60 is considered exceptional (<https://paperpile.com/g/what-is-a-good-h-index/>). The index has a dependence on time, so “h-index since 2017” is included. These metrics indicate strong and widely recognized excellence in scholarship.

More detail is provided in Appendices 4–6.

IV. RESEARCH

a. Areas of research emphasis

PPA faculty are engaged in a wide range of well-funded, nationally and internationally collaborative projects that transcend the boundaries of plant and microbial biology. Historically, research in the Department has included internationally recognized strengths in Plant Virology, Plant Mycology, Plant Immunity, and Applied Plant Pathology. However, Plant Pathology is, by its nature, highly multidisciplinary, with significant crossover applications in human infectious disease and health, mammalian immunity, food/feed safety and security, and environmental impacts on emerging diseases. Thus, our department routinely works across disciplinary boundaries and synergizes with other programs inside and outside the college to address global issues of food security, emerging infectious disease, and impacts of environmental stress and climate change. Furthermore our faculty represent significant sources of technical expertise and program leadership in diverse areas including cell and molecular biology, genetics, genomics, computational biology, biochemistry and metabolomics, and field- and greenhouse-based assays of infectious disease.

Following are descriptions of specific research areas. More detail is provided in Appendices 4–6.

Virology research continues to be an area of strength with the outstanding contributions of Peter Nagy, but our capacity in this area has been significantly diminished by the retirement of Said Ghabrial, and later by the tragic and untimely death of Michael Goodin. In addition to groundbreaking research that furthers our fundamental understanding of the cellular and molecular biology of viral disease, PPA virologists have developed important tools enabling functional studies of heterologous proteins in plants that have been widely used by the national and international plant biology community. Some of these tools have also generated significant revenue for the University through technology licensing by agricultural biotechnology companies. Nagy continues this tradition in his innovative and exciting work on viral replication and recombination, using heterologous systems to study these processes to not only improve understanding of plant viruses, but also in highly infectious human viruses (including Covid-19) that cannot be easily researched through other methods. Nagy’s contributions have dramatically progressed our understanding of animal/human viral diseases in addition to plant diseases.

Through successful competitive grants Nagy, Goodin and others also pioneered and, very recently, upgraded the confocal microscopy instrumentation for the college. Nagy directs the department’s Michael Goodin Center for Agricultural Fluorescence-microscopy Experiments and Biological Imaging (CAFE-BI), which is a crucial resource for all department RTF and many other programs throughout the college, and also serves a crucial educational role for undergraduates and others. For example, a Plant and Soil Sciences faculty member has already used the new instrument for a Confocal Microscopy course.

Mycology research is the focus for three RTS faculty members, Vaillancourt, Farman and Schardl. These researchers collaborate extensively with each other, and also with ETS and STS faculty to solve fungal disease problems that are of specific importance to Kentucky stakeholders, and to develop outreach and educational programs for Kentucky citizens. Farman and Vaillancourt in their work study mechanisms of pathogenicity and evolution of important grain pathogens in the *Magnaporthe*,

Fusarium, and *Colletotrichum* genera. Their goals include improved surveillance methods to track emerging diseases, and better understanding of mechanisms of pathogenicity that can be used for more targeted development of host resistance.

Farman's work on the evolutionary origins and diversity of wheat-blast strains of *Magnaporthe oryzae* is crucial for protection of wheat production and trade, as this devastating disease has spread from South America to the Indian subcontinent. So far, a single case was identified in Kentucky by Don Hershman (Extension Plant Pathologist, now retired), and Farman's comparative genomics indicated a concerning relationship to gray leafspot of ryegrass, which is common in the United States. Farman's program is revealing fascinating new principles in the evolution of emergent fungal pathogens as they adapt to and sometimes devastate new crop hosts.

Schardl's group focuses on grass endophytes, of which some can cause toxicosis in grazing animals, costing the cattle and equine industry close to one billion dollars annually. His group is improving strains to provide their protective advantages to forage and amenity grasses, but without producing anti-mammalian toxins. They discovered the genes for the infamous ergot alkaloids, anti-insect aminopyrrolizidines (such as lolines), and indolizidines such as the locoweed cytotoxin, swainsonine. Comparative genomics, transcriptomics and metabolomics have revealed dynamic diversification mechanisms with implications for endophyte applications in agriculture and conservation biology. Recently, his group demonstrated facile and precise removal of large gene clusters using CRISPR/Cas9.

All three of these mycological researchers utilize genomic approaches in their research: Schardl and Farman took the lead to bring genome sequencing and bioinformatic capacity to our college by establishing the Advanced Genetic Technologies Center (AGTC), which was the forerunner of the Genomics Core Laboratory that now resides in the College of Medicine. Farman has also been instrumental in bioinformatics training programs, establishing a summer workshop that has served hundreds of Kentuckians and others, teaching fundamentals of bioinformatics analysis, and providing important professional training opportunities.

Plant Immunity: Two RTS faculty, Pradeep and Aardra Kachroo, collaborate extensively in studies of plant immunity with an emphasis on long distance signaling, systemic resistance, and overlap between plant primary metabolism and disease physiology. Following a long tradition in the department of developing management applications from basic research in mechanisms of plant immunity, the university recently submitted a patent application based on their observations. Moreover, A. Kachroo was selected for the Fall 2021 cohort of the University's Launch Blue UAccel program, which offers professional development training for innovators to enable a viable commercialization path for their technology.

Both Aardra and Pradeep Kachroo are involved in multiple multidisciplinary projects focused on sustainable production of healthy foods with collaborations across colleges within our university as well as with national and international collaborators. For instance, P. Kachroo and faculty from the College of Arts & Science are testing chemical formulations to improve carbon sequestration by plants. He is also engaged in collaborative projects with faculty in the Department of Plant and Soil Sciences, the College of Engineering, and Kentucky State University, addressing the nutritional value of full-fat soybeans and improving the nutritional value of soy-based aquaculture feed. In another collaborative project with Kansas State University, P. Kachroo is developing new varieties of industrial Hemp with a focus on low THC content and improved oil quality. Given the importance of hemp for Kentucky, this project has direct implications for the state's economy as well as hemp producers and consumers. In addition, P. Kachroo has several on-going industry funded projects testing various agrichemicals.

Pradeep Kachroo also directs the college Analytical Center (<https://plantpathology.ca.uky.edu/lab/Analytical-CORE>), and Plant Growth Facility (<https://plantpathology.ca.uky.edu/research/facilities/clear>) having been responsible for acquiring and maintaining walk-in and reach-in growth chambers, and chromatography equipment including HPLC, GC, GC-MS and—with his recent success as PI of an USDA equipment grant—a qTOF LC-MS.

Aardra Kachroo has collaborated with faculty from Colleges of Pharmacy and Arts & Science to develop federally funded multidisciplinary projects. She is currently engaged in a nation-wide stakeholder agency-funded collaborative project aimed at developing genetic resources to manage economically important, soil-borne diseases in soybean. Through an NSF-SBIR funded project, A. Kachroo is involved in applied research testing formulations of products for broad spectrum disease management in soybean. Her work demonstrating the conservation of SAR signaling mechanisms in crops like soybean has direct implications for Kentucky and U.S. agricultural economies. In addition, her work demonstrating overlaps between the SAR signaling pathway and legume responses to beneficial rhizobia has implications for improving nitrogen fixing capabilities in legumes.

Applied Plant Pathology: ETS faculty focus primarily on commodity-oriented research that addresses the needs of stakeholders, particularly with emphasis on disease management and grower profitability. This research includes numerous plant-pathogenic fungi and oomycetes, as well as some nematodes, bacteria, and viruses.

Dr. Carl Bradley has statewide extension and applied research responsibilities for disease management in soybean and small grain crops (barley, rye, and wheat). These crops are planted on over 2 million acres annually in Kentucky, worth approximately \$1.0 billion to \$1.3 billion annually (2016-2020). He came to the University of Kentucky in July 2015 and is based at the UK-Research & Education Center in Princeton, KY. Since arriving to UK, Dr. Bradley has been awarded over \$2 million in competitive grants and industry-supported funding, has published over 75 peer-reviewed journal articles, 4 book chapters, and 52 extension publications. He has given over 100 face-to-face and virtual presentations while at UK, reaching thousands of stakeholders and clientele from Kentucky, across the nation, and abroad to several countries. He currently co-advises 2 graduate students and is a committee member on three graduate students committees across two departments at UK and at the University of Nebraska. He has graduated two M.S. students from his program at UK and has mentored eleven undergraduate students. His research program focuses on disease management, with an emphasis on fungicide resistance. He frequently collaborates with other members of the department, including Dr. Farman, Dr. A. Kachroo, Dr. P. Kachroo, Dr. Vaillancourt, and Dr. Wise.

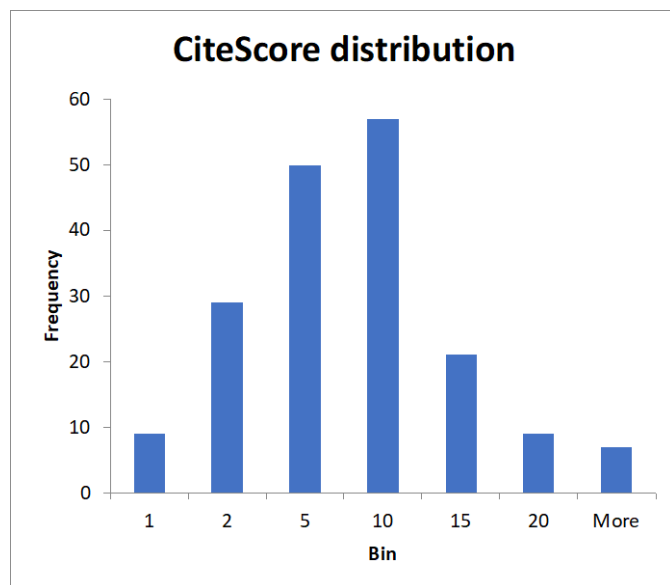
Dr. Wise joined UK in 2017, at the University of Kentucky Research and Education Center in Princeton, KY, with responsibility for research and Extension programs on corn, sorghum and forage diseases. Her research program focuses on understanding the diversity of the organisms causing disease on her assigned crops, including laboratory research studying how pathogens evade management efforts, such as fungicide resistance and changes in pathogen diversity. Her field research program focuses on optimizing crop production practices to minimize disease impact, examining new fungicide technology, such as drone applications, and surveying for disease threats such as corn nematodes and new diseases like tar spot. Dr. Wise has authored or co-authored 35 extension publications and has published 37 peer-reviewed journal articles since her arrival. Dr. Wise has generated over \$875,000 in research grants and gifts and has given over 90 presentations since 2017, including over 20 invited presentations at national and international meetings. She advises two graduate students, co-advises three graduate students, and is a committee member on four additional graduate student committees across two departments, and has had 5 undergraduate interns in her program. She leads several national efforts to coordinate fungicide resources and collaborates frequently with other members of the department, including Dr. Bradley, Dr. Vincelli, and Dr. Vaillancourt.

Specialty crops pathologist Dr. Nicole Gauthier has a 100% Extension FTE but includes applied research within her program. Since her hire, she has collaborated with Vaillancourt to survey, characterize, and manage bitter rot of apple caused by *Colletotrichum* spp.; they have co-advised two MS students and mentored undergraduates. In 2014, when hemp was reintroduced to the US, Gauthier took on responsibilities for the crop. An ongoing survey has confirmed more than 25 diseases, five first reports, and multiple invited presentations for states with emerging hemp programs. Research includes speciation and characterization of the causal agents of these pathogens (molecular diagnostics, phylogenetics), as well as investigation into cross infection and overwintering potential within these cropping systems. Collaboration with Schardl resulted in a co-advised MS student. Other collaborations include Departments of Entomology, Horticulture, and Plant and Soil Sciences. Current hemp research is focused on Fusarium bud and flower blight and Fusarium head blight caused by *Fusarium graminearum* and at least 4 other species, likelihood for mycotoxin production, and cross infection potential with cereal crop rotations. This project is in collaboration with departments within the College, as well as with USDA FAPRL and includes training of 8 undergraduate students. Recent acquisition of vegetable responsibilities has led to a strong collaborative relationship with a vegetable horticulturist. Field and laboratory research include cultural management and preventative modes for control of *Sclerotinia* spp. and *Meloidogyne* spp. in vegetable crops.

b. Research productivity including undergraduate and graduate students

The Plant Pathology faculty have been highly successful in scholarly achievement, publishing between 21 and 42 peer reviewed journal articles each year, for a total of 202 from 2016-2021. All faculty title series—ETS, RTS and STS—have contributed substantially to this total. The median Scopus 4-year CiteScore value was 5.1, with some papers published in extremely high-profile journals such as Science (CiteScore = 49.4), Nature Biotechnology (44.8), Cell Host and Microbe (28.2), Nucleic Acids Research (23.5), Nature Chemical Biology (23.3), Nature Communications (18.1), Annual Review of Phytopathology (17.8), Molecular Plant (16.5), and PNAS (16.1).

Papers from the department received a total of 3,877 citations in 2016-2021. It is noteworthy that the second-highest number of citations was for a paper in Plant Health Progress (CiteScore = 1.0). This is a society journal for applied research in our discipline, so that high citation number indicates that the paper is extremely important to stakeholders. The department’s Field-Weighted Citation Impact was 1.71, meaning 71 % above the global average for the field. Forty-one (19.4 %) of our papers were in the top 10 % most cited publications.



Top five research topics (from Scopus).

Topic	Output	Field-Weighted Citation Impact*	Prominence Percentile
Tombusvirus	32	1.41	83
Systemic Acquired Resistance	13	1.87	98
Endophyte	12	1.74	97
Fusarium Head Blight	9	0.87	98
Blast Resistance	9	2.63	91

*FWCI relative to the global average for similar publications; for example, 2.63 means 163 % more than the global average, and 0.87 means 13% less than the global average.

As discussed earlier, graduate students have generally been successful in obtaining their degrees and, in the process, producing scholarly publications and products. Furthermore, they have gone on to careers most often fitting with their original goals. Undergraduates, too, are frequently involved in the research as paid interns or under auspices of independent study courses such as PPA 395, ABT 395 and ABT 396. In recent years, four undergraduates have coauthored refereed publications from the department.

c. Funding

The PPA faculty have a strong record of success in competitive grant funding, including federal awards. Seven of the eight RTS, all of the ETS, and the STS faculty member have federal competitive grant awards. Several of these awards are more than \$1,000,000 each, and several are multidisciplinary and multi-institutional grants. Many also have other sources of funding, such as from industries and agricultural commodity groups.

2020-2021 Direct Awards/Faculty Ratio

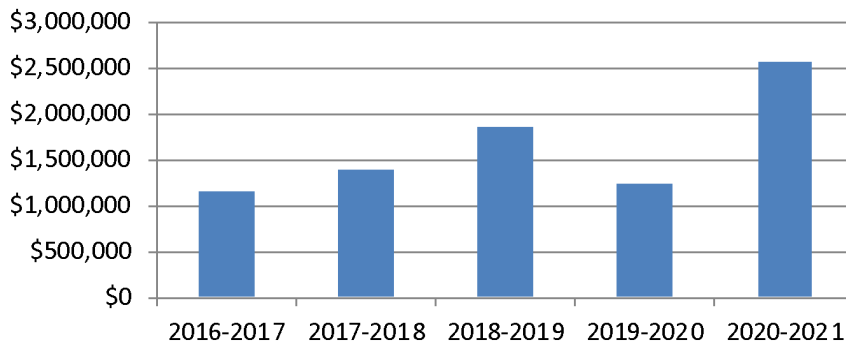
	Total FT Faculty	FTE Research Faculty
	14*	5.71
Total	\$2,572,292	\$2,572,292
Average	\$183,735	\$450,489

*At the start of FY 2020 the department had 14 faculty, which was reduced to 12 faculty by February 2021.

2020-2021 Fiscal Year Grants

Direct Awards (subtotal)	\$2,572,292
Federal Competitive	\$1,374,711
% Federal Competitive	53%
Collaborative	\$1,741,916
2020-2021 Gifts and Income Awards	\$306,050

Direct Awards Five-Year Trend



V. SERVICE, EXTENSION, AND OUTREACH

a. Public service, extension, and non-extension

Extension program

The Plant Pathology Extension team consists of 4 commodity-focused faculty specialists (total 3.34 FTE); the two Princeton-based specialists work on grains crops, one Lexington-based faculty member focuses on specialty crops, and one Lexington-based faculty member focuses on special projects such as the online STO degree program. However, due to the reduction in PPA Extension FTE, as of January 2022 ornamentals and tobacco are no longer covered by a faculty specialist.

Activities of the Extension specialists align with University and College goals. Through outreach and education, the team of specialists helps improve lives and secure the food supply for the people of the Commonwealth and beyond. Relationships with growers and stakeholders is an important step in disseminating scientific knowledge. Improvement of crop yields is a critical economic development focus. Through applied research, including many multidisciplinary collaborations, the team improves the knowledgebase of the agricultural and scientific community. This new information reaches stakeholders through grower resources and peer-reviewed scientific publications. Student and postdoc mentoring contribute to jobs training, particularly as these students often remain in agricultural fields and are competitive in a global market.

Each specialist creates diverse programming based on industry needs and stakeholder assessments, and each program is unique in the most effective ways to promote sustainable plant disease management in Kentucky.

Peer-reviewed Extension publications continue to be important outputs, along with presentations at key local, regional, and national meetings. The use of social media to engage with clientele continues to grow since our previous review. Personalized agent trainings, involving local site visits, are often provided for Agents, with a focus on new Agents. The Extension Team's applied research programs in plant pathology, while always important, have grown in size and importance since previous reviews.

Since the previous review, the Extension team expanded its use of Zoom and other distance-learning technologies for agent trainings and updates. Without question, our prior familiarity with such technologies helped us make the transition to providing extension programming during the COVID-19 pandemic. Furthermore, the use of this technology has allowed us to educate beyond state lines and borders.

Faculty members are involved in multiple national Extension groups, contributing research and extension information to national projects on plant disease management. Several of our faculty

members lead these national efforts, emphasizing the important role of UK Extension Plant Pathology in national plant disease extension efforts.

Highlights of the Extension program are appended (Appendix 4).

Plant Disease Diagnostic Laboratory

PDDL is a major centerpiece of PPA and is administered as part of the Extension program. Approximately 1,800 to 2,800 samples are processed each year (6-year average 2,388). On average, 73% of samples are diagnosed by visual inspection or microscopy, and less than 1% are diagnosed by molecular methods. Most samples are submitted through county-based Extension offices (66% Lexington, 86% Princeton), but stakeholders can submit samples directly to the lab (17% Lexington, 9% Princeton). Currently, PDDL does not have a charge for samples. A fee-based system has been intended to take effect in 2023, although progress towards this goal has been slowed as the Extension team has attempted to address the lack of complete coverage of commodities and the destruction of facilities in Princeton. Besides direct benefit to stakeholders, Specialists use the diagnostic lab as a first-detection, as critical and emerging issues are often evident through diagnostic submissions.

PDDL sample numbers by year.

Faculty specialist	2018		2019		2020		2021 (through Nov 3)	
	Category	Total	Crop Cate	Total	Crop Cate	Total	Crop Cate	Total
Wise	Corn	49	Corn	56	Corn	83	Corn	82
Wise	Forages	49	Forages	42	Forages	49	Forages	33
Gauthier	Hemp	43	Hemp	153	Hemp	39	Hemp	12
Bradley	Soybean	102	Soybean	60	Soybean	67	Soybean	83
Bradley	Small Grain	37	Small Grain	21	Small Grain	25	Small Grain	25
Vacant	Tobacco	238	Tobacco	169	Tobacco	130	Tobacco	140
Gauthier	Fruit	227	Fruit	189	Fruit	105	Fruit	146
None	MISC	52	MISC	55	MISC	37	MISC	24
Vacant	OR- Herba	255	OR- Herba	183	OR- Herba	162	OR- Herba	121
Vincelli	OR-Turf	78	OR-Turf	58	OR-Turf	91	OR-Turf	47
Vacant	OR-Wood	1236	OR-Wood	1136	OR-Wood	769	OR-Wood	767
Gauthier	Vegetable	487	Vegetable	362	Vegetable	377	Vegetable	263
	Total	2853	Total	2484	Total	1934	Total	1743

Prior to the Dec. 2021 tornado and a recent retirement, PDDL had a presence both in Lexington and in Princeton. Currently the Lexington PDDL, with 1.75 FTE, must serve the needs of the entire Commonwealth. In addition to providing statewide diagnostic service, our up-to-date diagnostic records serve as a basis for promulgating timely extension programming on diseases and their management. Our diagnostics program remains well-integrated into the National Plant Diagnostic Network.

The Plant Pathology Extension Team conducted a survey to assess the Plant Disease Diagnostic Laboratory (PDDL) stakeholder needs and determine program impact. Over 89% of respondents said the diagnosis they received influenced a management decision and that the average value of a PDDL diagnosis was over \$2,000 per sample. Woody ornamentals were the most frequently submitted commodity (21%) followed by vegetables (16%). Fruit, herbaceous ornamentals, grains and tobacco were the next highest submitted commodities, in order.

b. Service to the professions

All PPA faculty members contribute extensively to the wider scientific community in a variety of venues. For example, several have served in leadership roles with the American Phytopathological Society (APS): Bennett as the President of APS and President of the International Congress of Plant Pathology held in Boston, MA in 2018; Gauthier as President of APS Southern Division and organizer

of the Southern Division conference; and Hirsch as APS Webinar Editor and a member of the APS Office of Education. Bradley has served as President of the Southern Soybean Disease Workers, Chair of the National Fusarium Head Blight Forum Organizing Committee and Chair of the Plant Management Network – Focus on Corn Committee. Wise is on the Board of Directors of the Crop Protection Network. Schardl was the Scientific Program Director of the 11th International Mycological Congress (San Juan, PR, 2018). Vincelli served for a year as a Jefferson Fellow for the U.S. Agency for International Development, a competitive position of full-time service in Washington D.C. Currently Vincelli is the 1862 Land Grant University Coordinator and Liaison for the Southern Sustainable Agriculture Research and Education (SARE) USDA Program.

Faculty serve on editorial boards of numerous journals that are high profile in our disciplines, including society journals. Some have or had Editor in Chief or Senior/Executive Editor roles: Wise for APS Press, Vaillancourt for *Molecular Plant Pathology* and *Tropical Plant Pathology* P. Kachroo for *BMC Plant Biology*, and Schardl for *Mycologia*. Others are or were on editorial boards of *Journal of Virology*, *PLoS Pathogens* and *Virology* (Nagy), *Crop, Forage & Turfgrass Management* and *Canadian Journal of Plant Pathology* (Bradley), *Frontiers in Plant Science* (A. Kachroo), *Plant Science*, *Journal of Integrative Plant Biology* and *Plant Signaling and Behavior* (P. Kachroo).

Our faculty are all well known nationally in their areas of expertise. They are frequently invited to cooperate on collaborative research, extension and outreach projects. They are often invited to give seminars, present at national and international meetings, and organize meetings and symposia. They are in high demand to serve on study panels, which include multiple panels each for USDA-NIFA, USDA-ARS, NSF, NIH-NIAID, USAID, and the U.S. Department of Energy, as well as on panels for the Oklahoma Center for Advancement of Science & Technology, the Middle East Regional Cooperation Program, The Ohio State University, and AAAS.

c. Service to the institution

The PPA faculty have been heavily involved in service at the college and university levels. Three members have served on the University Senate (Gauthier, Goodin and Vaillancourt). Four have served on the CAFE Faculty Council (Farman, Hirsch, A. Kachroo, Vaillancourt). Also, Wise and Bradley have served on the CAFE Committee on Appointments, Promotion and Tenure, A. Kachroo has served on the Administrative Regulation (AR) 6:2 Appeals Board, Vaillancourt has served on two separate Area Committees, and Bradley has served on the Senate Advisory Committee on Privilege and Tenure.

Vaillancourt has also served on the University Senate Council the university's Graduate Council, the Provost's Ad Hoc Implementation Committee for the Blue-Ribbon Panel on Graduate Education. and a Department Chair Search Committee in the College of Medicine.

Bradley and Wise also serve roles in support of the UKREC in Princeton, KY, such as the Graduate Student Housing Committee, Storage Space Committee and Greenhouse Committee (Wise), and the UKREC Advisory Committee (Bradley).

One of our department faculty, Paul Vincelli, spearheaded and led (as DGS) an online multidisciplinary MS degree in Science Translation and Outreach (STO;

<https://www.uky.edu/academics/masters/science-translation-outreach-online>), which is a collaboration between multiple departments and to which Vincelli and another PPA faculty member, Rick Bennett, contribute significant instruction. Vincelli is known nationally and internationally as a master teacher, having received numerous teaching awards. The STO program is targeted especially for continuing education of Extension Agents and provides an opportunity for workforce development for these critical university staff who serve directly in every county the needs of Kentuckians. This program will undergo review independent of the PPA Department, and the committee is not charged with making recommendations for the STO Program.

VI. DIVERSITY, INCLUSIVITY, AND CIVILITY

a. Promotion of diversity and inclusivity

As stated elsewhere, PPA is committed to diversity in faculty, students, and staff. We recognize diversity as a fundamental source of enrichment in life and scholarship that is highly beneficial to the teaching, research, and extension missions, and to the social health of the group and mental health of individuals. We also recognize challenges in attaining desired levels of diversity such as ethnic and racial diversity among faculty, staff and domestic students, and gender parity among faculty.

The college Office of Diversity, Equity and Inclusion has just developed a new DEI Strategic Plan and formed a committee with representation from each academic department. Dr. Goodin previously served as the Plant Pathology representative, and a new representative needs to be chosen. The committee is looking at options and resources for enhancing DEI awareness, recruitment/retention, and infusing DEI in the curriculum. Recommendations from the External Review Committee are welcome.

College faculty and staff hiring practices are designed to ensure search committees limit unconscious bias and job postings are shared among diverse populations of potential candidates. Please see <http://administration.ca.uky.edu/ofrpa> for more information on the faculty hiring processes.

For six department-funded staff positions advertised over the past six years, a total of 200 applications were received. Demographic data for the applicants and current demographics for Lexington/Fayette County and for Kentucky are given in the table below. Of those disclosing race/ethnicity, percentages of Hispanic/Latino and Black or African American were considerably below the percentages for the county, but much closer to those of the Commonwealth. Of those disclosing gender, a disproportionately high percentage were female. Suggestions are welcome for strategies to better encourage applications from traditionally underrepresented minorities.

Applicant pool demographics for six department-funded staff positions (n = 200)

<i>Category</i>	<i>Percent of applicants</i>	<i>Percent of those who disclosed</i>	<i>Percent in Lexington/Fayette population</i>	<i>Percent in Kentucky population</i>
<i>Race/Ethnicity</i>				
<i>Hispanic/Latino</i>	1.5	2.4	7.2	3.9
<i>American Indian or Alaska Native</i>	0	0	0.1	0.3
<i>Asian</i>	2.5	3.9	3.7	1.6
<i>Black Or African American</i>	5.5	8.7	14.5	8.5
<i>Native Hawaiian or Other Pacific Islander</i>	0.0	0.0	0.0	0.1
<i>Two Or More Races</i>	2.5	3.8	3.5	2.0
<i>White</i>	51.5	81.1	71.0	87.5
<i>Undisclosed</i>	36.5	N/A	N/A	N/A
<i>Gender</i>				
<i>Female</i>	50.0	77.5	51.0	50.7
<i>Male</i>	14.5	22.5	unavailable	unavailable

b. Civility among faculty, staff, and students

The department enjoys a generally high degree of civility among faculty, staff and students, which is essential for the joint accomplishments and the function of the department. Even so, there is room for improvement. The university provides resources—including expert advice, counseling, and training—to enhance civility and resolve disputes, and departmental faculty, students and staff have all utilized those resources. Among the results has been the ultimate success of several graduate students who at some point experienced difficult communication with, and meeting expectations of, advisors and advisory committees.

An important aspect of department collegiality is social engagement that is not directly related to work or varies and invigorates the work environment. The department has traditionally engaged in a number of regular social activities. Over the past six years, the **Association of Plant Pathology Scholars (APPS)** has taken a very significant role both in those traditional activities and in initiating and/or facilitating new ones.

APPS includes the graduate students and postdoctoral scholars in the Department of Plant Pathology. The main objectives of the association are to enhance networking among the graduate student community, foster outreach with the industrial and academic scientific communities, and provide professional enrichment opportunities to scholars. APPS meets once a month to discuss continued initiatives and disclose academic announcements with students. This student organization actively tries to address scholars' demands based on internal survey trends. For instance, APPS put together an annual mental health assessment to understand the physical and emotional wellbeing of scholars in the department. As a result, it proposed to modify the departments' Annual Review of Progress to provide students with the opportunity to formally communicate their needs/ concerns regarding their mental health and degree progress to mentors and principal investigators. APPS also organized a carpool program to offer weekly transportation for students to nearby grocery stores. APPS launched outreach activities such as the lab-shadowing program to foster opportunities for teaching and learning new experiments in a collaborative environment. In 2020, APPS organized a campaign that resulted in removal of the Graduate Record Examination (GRE) test as an admission requirement for the department, thus promoting equity for graduate students worldwide. Moreover, prior to the pandemic, APPS held three annual events: a breakfast and two dinner cookouts. The department also holds its annual winter holiday luncheon (except during the pandemic), which is organized mainly by the staff and APPS leadership.

c. Stakeholder engagement

As expected in a department with a strong and widely lauded Extension group and diagnostic laboratory (PDDL), stakeholder engagement is front and center of much of what we do. The extension aspects are elaborated elsewhere in this document, so here we emphasize other significant stakeholder engagement.

The agriculturally relevant stakeholders most regularly engaged by our RTS faculty members are the Kentucky soybean, small grain crop and corn growers. Also, through the annual Coalition for National Science Funding exhibition, faculty have engaged congressional staff, state representatives, Agricultural Commissioners, agriculture industry lobbyists and NSF staff.

We also consider Extension Agents to be key stakeholders and have instituted programs for their continuing education in our discipline. Vincelli has established distance-learning PPA courses tailored to their needs and schedules, and he has spearheaded the new Science Translation and Outreach (STO) MS degree program mentioned above.

As public sector educators and scientists, other educational institutions and the wider public are important stakeholder groups. The department is proud of exceptionally wide and diverse engagement with K–12 schools, such as the Carter G. Woodson Academy (<https://www.fcps.net/domain/3326>) through which several minority high-school students have participated in research internships in the department (facilitated by Vaillancourt). Some have gone on to college STEM programs. Other activities include Lexington Youth Science Summit, Frontiers for Young Minds and the Girl Scout's Girls in Engineering Math & Science (GEMS) program (A. Kachroo). Our new STS faculty member (Hirsch) has a vibrant outreach program to local and regional K–12 schools which he has grown rapidly to other states and nationwide.

VII. ADMINISTRATION AND GOVERNANCE

a. Administrative structure and effectiveness

The Department of Plant Pathology has a Rules of Procedure and Structures of Committees document, last updated February 2019 by vote of the faculty of Plant Pathology. The administrative officers in the Department are the Chair, the Director of Graduate Studies (DGS), and the Extension Coordinator. Responsibilities of the Chair and the DGS are largely spelled out in the University of Kentucky Governing and Administrative Regulations.

Among the responsibilities of the Chair are budget management, overseeing evaluations of faculty, and allocation of departmental space.

The DGS is appointed by the Dean of the Graduate School upon recommendation of the Chair. Responsibilities of the DGS include corresponding with individuals enquiring about the graduate program, chairing the Academic Program Committee and performing all normal activities of a DGS as expected by the Graduate School.

The Extension Coordinator, appointed by the Chair, facilitates activities of the department extension program, appropriate use of funds designated for extension activities, and operation of the two Plant Disease Diagnosis Laboratories (PDDL), and advises the chair on the departmental matters related to extension and PDDL.

The Department has four standing committees: Academic Program Committee, Faculty Merit Review Committee, Resource Committee and Safety Committee. Though expected service on the committees is two years, most serve much longer except on the Faculty Merit Review Committee, for which two-year terms are mandated. All standing committees are advisory to the faculty and the Chair.

b. Governance-related policies and procedures

Departmental meetings are called by the Chair at least every two months during the academic year. All employees of the department are informed at least one week ahead of the meeting, and agenda items are requested. At the meetings, the faculty or a subset of the faculty under circumstances specified by University Regulations have voting privileges. Though not legally required, the Department strives to adhere to the Kentucky statutes on open meetings, which limits the purposes allowed for closed meetings where some persons are excluded, and minutes are unrecorded. Decisions are only taken by vote of the faculty in open meetings.

VIII. BUDGET AND FACILITIES

a. Facilities

Floor plans of the Plant Sciences Building (PSB) and greenhouses are attached (Appendix 7). The Department of Plant Pathology utilizes the whole of the second floor of PSB, plus several rooms on the first floor (113, 122, 122A–C, 125, 126, 129 and 133). Laboratory space in Lexington has been adequate but by no means excessive for current research and extension programs there.

The Lexington Extension laboratory is located in room 125 and half of room 129 on the first floor, and the other assigned rooms are almost completely dedicated to plant growth facilities.

On the second floor of PSB, laboratory space is generally assigned according to the sizes and needs of the groups. An open-plan laboratory space from rooms 236 to 264 is shared by, in order, the Schardl, Pradeep Kachroo, Vaillancourt and Farman groups. The partitioned labs on the other side of the

hallway are currently assigned to Aardra Kachroo (231-231A), Princeton Extension (235), and Peter Nagy (239, 243A and 243).

Room 235 had been assigned to the late Michael Goodin, but currently is used by some of the extension group whose laboratory facilities in Princeton, KY, were destroyed in the December 2021 tornados. Future plans are to rebuild the Princeton facilities and to fill the Goodin vacancy and reassigning room 235 accordingly.

Rooms 264A, A1 and B in PSB are containment labs designed for biosafety level B2. Also on that floor are two cold rooms (252 and 254) and two variable-temperature environment rooms (238 and 242), a gel- and phosphor-imaging facility (234), a microscope suite (246C), and an autoclave/ dishwashing room (258), plus equipment rooms (240 and 262).

Other rooms under PPA purview are dedicated to two recent major equipment acquisitions: the Olympus FV3000 super-resolution confocal microscope in room 260 PSB, and the Q-TOF liquid chromatography/mass spectrometry system in room 331 PSB. These rooms are small and leave no room to grow nor (importantly) for their intended role in educational enrichment to engage even a small class of undergraduates. For the confocal microscope a monitor has been mounted in the hall outside to help address this need, but a similar approach is impractical for room 331.

The greenhouse facilities (attached) include zones 102, 103, and 104 of Greenhouse 1, and all five zones of Greenhouse 4, for a total 6570 sq. ft.

The Plant Disease Diagnostic Laboratory (PDDL) on the Lexington Campus is located in rooms 115, 116, and 117A, B and C at the east end of the greenhouse complex (totaling 600 sq. ft.). The PDDL in the UKREC/Grain and Forage Center of Excellence at Princeton, KY, was destroyed by the tornado. The nature of a future Princeton-based PDDL remains to be determined.

b. Equipment

PPA faculty have been particularly active and successful in building the physical research capacity of the College. For example, Dr. Michael Goodin was instrumental in developing state-of-the-art confocal microscopy capabilities for the College. Most recently, before his untimely death, he had led a successful multidisciplinary effort to obtain funding for a state-of-the-art Olympus FV3000 super-resolution confocal microscope, to be housed in a new research and educational microscopy center in the Plant Sciences Building. This facility, which was brought on line and is now being administered by Dr. Peter Nagy, has been named in his honor the Michael M. Goodin Center for Agricultural Fluorescence-Microscopy Experiments and Biological Imaging (CAFE-BI). It includes, as Michael envisioned, a hallway monitor for students and other interested parties to observe the work going on inside, and a link to a new remote teaching room on the second floor. In yet another example, P. Kachroo leveraged his biochemical expertise to set up a metabolomics core facility (Center for Agricultural and Life Sciences Metabolomics; <https://plantpathology.ca.uky.edu/lab/Analytical-CORE>) and garnered significant funding to acquire state-of-the art instrumentation for this center.

Microbiological and molecular analyses are key to our basic and applied research programs, as well as for instruction. The CAFE-BI includes a range of older epifluorescence and light microscopes in addition to the new Confocal microscope. Some of these older instruments would benefit from upgrades particularly to the camera and computer systems. Chromatography equipment includes multiple gas chromatograph/mass spectrometry (GC/MS) systems, in addition to the new Q-TOF liquid chromatography/MS system. A wide variety of other critical equipment is housed in PSB, much of which is older and in need of replacement. Among these are imaging instruments such as the GE Typhoon (acquired in 2013 with Federal formula funds) used for phosphorimaging and related technologies, and the Bio-Rad gel imaging system.

Growth chamber space is always at a premium, but in the last 6-year cycle the College apportioned substantial Federal formula funds to purchase three new chambers located in the seed house near the greenhouses. An NSF-MRI proposal was submitted by P. Kachroo this January for funds to purchase or upgrade growth chambers for four CAFE departments including PPA, Entomology, Horticulture and Plant and Soil Sciences. Greenhouse space is also critical for several of the RTS and ETS programs. The facilities are barely adequate for our needs: in particular, the lights have needed frequent expensive repairs.

The ETS faculty utilize microscopes and other basic lab equipment in their research, but they also have field programs that require several major farm equipment items. Almost all laboratory and field equipment was destroyed or severely damaged in the Dec. 2021 tornado at UKREC. The destruction of the vehicle fleet at Princeton further compromises the ability of that group to conduct field research as well as to conduct meetings and visits to stakeholders.

c. Budget

Within the past 6 years the University of Kentucky has mandated cuts in the state-supported budget in 2015 (1 % to the department) and 2021 (9.5 % to the department; see Appendix 8). The department has also been required to absorb part of the merit pool raise in 2019 (at 0.5 %), and is expected to do so again in 2022 (at 1 %).

Plant Pathology Budget 2021-2022

Income		Expenses		Total
State Instruction	\$316,829.58	Faculty Salaries	\$1,551,143.84	
State Research	\$911,973.01	Staff Salaries	\$1,076,190.28	
State Public Service	\$470,057.42	Equip. maint. contr.	\$47,036.56	
State subtotal	\$1,698,860.01	Converged fees	\$34,884.00	
HATCH	\$476,404.27	Current expenses	\$65,321.73	
MULTI_STATE	\$46,735.23			
AG-PP COOP EXT SER	\$42,190.97			
Federal subtotal	\$565,330.47			
Enrichment	\$43,000.00			
CAFE commitments	\$350,199.48			
Total Income	\$2,657,389.96	Total Expenses	\$2,774,576.41	(\$117,186.45)

In 2011, when the previous Chair (David A. Smith) retired, PPA had 13 funded faculty lines (Farman, Ghabrial, Goodin, Hartman, Hershman, A. Kachroo, P. Kachroo, Nagy, Schardl, Seebold, Smith, Vaillancourt, and Vincelli). Soon thereafter, the Smith position was dissolved. Currently the department has only 11 faculty funded at the department level (Bradley, Farman, Gauthier, Hirsch, A. Kachroo, P. Kachroo, Nagy, Schardl, Vaillancourt, Vincelli, Wise), a formal but insufficiently funded vacancy (formerly occupied by Goodin), and one faculty member (Bennett) funded administratively.

The recent cut has left all technical and office staff funded for only 30 hr/wk. Any additional support must be identified from salary savings (such as the vacant Goodin position) or soft money.

Current expenses are funded at approximately \$60,000 per year, of which about \$35,000 is for “converged fees” to cover internet and telephone. Remaining funds are used for equipment repairs

(including some components of the building), office supplies, and of course only the most urgent faculty requests.

A long-standing program from the Office of the VP for Research (VPR) is to provide a percentage of F&A (“indirect”) grant funds back to the departments of the principle and co-investigators. Current policy is that 10% goes to the department, or 16% is split between collaborating departments (according to their percent contributions to the effort). The longstanding policy has been for these “enrichment funds.” to contribute to payment of equipment service contracts, which currently total over \$47,000.

Reflection

Faculty: Based on this self-study, the Department of Plant Pathology proposes addition of three new faculty lines:

ETS Extension Specialist/ETS faculty line, with training in advanced molecular diagnostics.
RTS Modeling/Epidemiologist specializing in emerging infectious diseases especially viruses.
RTS Phytobiome/Microbiome specializing in bacterial plant associations and environmental sampling.

A major conclusion of this self-study is that the Department of Plant Pathology must grow if it is to continue to meet its mission obligations for the College and the people of the Commonwealth now and into the future. The department has a track record of high value, but desperately needs new investment to grow. As this self-study makes clear, PPA is a powerhouse containing a group of extraordinarily talented, energetic and committed faculty and staff that consistently punches far above its weight in fulfilling the college and university missions in research, education, and service. Both the extension and research programs continue to be recognized for excellence, publish extensively in appropriate venues, and garner grant funding for extension, research and equipment needs. Recipients of our graduate degrees continue to be highly successful. Importantly, department faculty—Hirsch and others—are also heavily involved in administration of multiple undergraduate majors, teaching across many different departments and interdisciplinary programs targeting graduate and undergraduate students, and advising in ABT and other undergraduate programs.

The main difficulty, however, is that the small size of the department limits areas of the discipline that the department can cover for students, and commodity areas that ETS can cover for stakeholders. Major shifts in agriculture in Kentucky have strained the PPA Extension program. With increasing land area under cultivation in Western Kentucky, and the introduction of industrial hemp as a new crop throughout the Commonwealth, our Extension program faculty have been especially nimble. The two newest ETS faculty members replaced the one member previously at UKREC in Princeton and are integral to the new Grain and Forage Center of Excellence at that location. But this has been at the expense of one position on the Lexington campus. The rapid increase in vegetable production (field and high tunnel) and the ever-increasing need to address these grower needs from the Lexington location leaves the program currently unable to address ornamentals, trees and tobacco.

The first recommendation stemming from the 2015 program review was to create two new RTS faculty lines. The department reiterates that new faculty are **essential** to fill major gaps in our disciplinary and commodity coverage, while bringing fresh expertise in the newest techniques and experimental approaches. Such additional faculty will enhance the research program synergistically while also enriching the education of our students at all levels. After much thought and discussion, we have concluded that new faculty hires would be most impactful if they take the form of a cluster hire focused on environmental impacts on emerging infectious disease, an area that is highly amenable for collaborative, cross-disciplinary studies with important real-world impact on the most critical problems

we currently face. Thus, we would ask for three new faculty, one ETS with special training in advanced molecular diagnostics, and two RTS, one with a background in modeling of emerging infectious disease focused specifically on viral epidemics, and a second with a background in phytobiome studies focused specifically on plant-bacterial interactions and environmental sampling.

Extension and PDDL staff positions: A key feature of departmental support of stakeholders is the PDDL, which was distributed across the two locations until a retirement and the tornado in December 2021 closed the PDDL in UKREC at Princeton, Kentucky. UKREC had been serving the more intensive grain-oriented agriculture in the west of the Commonwealth, and Lexington served the more diverse commodities of central and eastern parts. There remains strong interest among stakeholders in reconstituting this arrangement once the center at Princeton site is rebuilt. However, recent experience has evidenced that having only a single staff member in one PDDL laboratory makes it acutely difficult to serve stakeholder needs and expectations. With these considerations, the department recommends hiring a PhD level PDDL Director who would also be expected to garner external grant funds. And, furthermore, the department suggests either of the following staffing options: (i) The recommended PDDL Director, Diagnostician and Diagnostic Aid (totaling 3 staff) to be located in Lexington, and all diagnostics to be performed there; or (ii) each of the Lexington and Princeton locations to be staffed with the Director or Diagnostician plus a Diagnostic Aid (totaling 4 PDDL staff).

Given the current financial situation, funding the recommended PDDL staff will be a challenge. The department contends that PDDL is a proven and major economic asset, worthy of increased funding. Additionally, the recommended PDDL Director should seek extramural funding, and the department suggests an expectation that 25 % of that person's salary be paid from such soft money. Finally, the department and college have been discussing a small fee per sample to help defray some of the costs.

Diversity: The PPA department recognizes that successes should be built upon, and recent setbacks must be overcome. For example, the department, university and community all felt the profound loss of Prof. Michael Goodin, an extraordinary and multitalented member of the faculty whose unique contributions to our culture came partly from his mixed Jamaican and Canadian heritage. If ever there was a special ambassador for the value of ethnic diversity, Dr. Goodin was such a person! As the department recruits applicants for new or vacant faculty positions, we are committed to the value of diversity.

The same holds for recruitment and diversity in other cohorts: students and staff. The department continues to have a diverse graduate student cohort, but increased student numbers—which of course requires funding in the face of inflation and super-inflationary tuition increases—would allow for even greater diversification. Increasing staff diversity remains a frustratingly elusive goal, as recent hires have increased staff diversity, but retirements/resignations have decreased diversity such that there has been no net gain. We continue to be mindful of the diversity goal and welcome suggestions for greater success.

In addition to ethnic and racial diversity, gender parity is an important goal. Student and staff cohorts in the department are close to gender parity, but faculty positions (at 33 % female) should be closer. The department needs to consider strategies for enhancing gender diversity, and notes that addition of faculty lines would facilitate this effort.

Equipment: The PPA department has always had significant major equipment needs, being heavily based in microbiology as well as plant biology, having strong basic and applied research programs, and utilizing sophisticated molecular and microscopic techniques for both basic and applied research. Over the years the college has been especially helpful in contributing towards growth chambers, including a recent match (together with the UK Research Office) in connection with an NSF-MRI equipment proposal. Department faculty have also been very active and successful in bringing new major equipment to the College. We plan to build on the recent successes in obtaining funds (without

matches) for a super-resolution Olympus FV3000 confocal microscope and an Agilent qTOF LC-MS, both as multi-departmental and multi-college resources. Nevertheless, much of the equipment on which the department depends is aging and becoming unreliable, and internal (college and university) competitions for equipment funding are much rarer now than they were in 2015. *An example is the aging Typhoon molecular imager, which urgently needs replacement.* It is important to emphasize that our research operation is absolutely dependent on state of the art, operational equipment and repair or replacement of this equipment is therefore not a luxury but a necessary investment that will result in much higher returns in funded grants and educational impact.

Laboratory Space: Since 2003 the research laboratories under direction of PPA have all been located in one building in Lexington (PSB; Appendix 7) and one laboratory at UKREC. The department has always been tight on space, and this has been exacerbated considerably by the recent acquisition of an Olympus FV3000 confocal microscope and an Agilent qTOF LC-MS as new college resources. The college, and especially those departments with a presence in PSB, have been helpful in space adjustments to accommodate these instruments. *The need for additional research laboratory space on the Lexington campus will be especially acute when new faculty are recruited as requested and with further acquisition of major equipment for the department and the college.*

The 600 sq ft PDDL laboratory located in the headhouse of the greenhouse complex in Lexington is divided into a main laboratory, an autoclave room and a cold room. The two staff there lack separate office space. *Dedicated office space for the PDDL staff would help address the current need.*

Laboratory space at UKREC, like all other PPA resources there, was eliminated by the December 2021 tornado. *The two PPA faculty based there must have a role in planning the new construction to include a wet lab, a clean room and an autoclave room for their research needs, as well as a new PDDL laboratory if so decided in consultation with stakeholders and administration.*

Greenhouse Space: The greenhouse (GH) complex has been steadily but not comprehensively upgraded over the years. A modern temperature regulation system has been installed at the expense of the college. The department has paid for automatic watering throughout GH 4, but not in GH 1 (insufficient funds). Supplemental lighting has been upgraded in one zone (out of five) of GH 4, paid for by a grant to Gauthier. *Lighting upgrades and automatic watering are needed in the rest of the zones of both GHs.*

APPENDICES

Appendix 1. Plant Pathology Implementation Plan Report FY 2021

Based on 2015-2016 Periodic Program Review

1. Create two new Regular Title Series tenure-track faculty lines in the department.

Assessment Method: Numbers of regular, full-time Plant Pathology faculty in each title series.

Results: Since 2016 there has been considerable flux in the number and nature of the department faculty. Three new faculty members were hired. One was an Associate Professor in the Extension title series (ETS), one was a Professor in the Regular title series (RTS), and the third was an Assistant Professor in the Special title series (STS). A new funding line was provided only for the STS position. The RTS position had been recruited to CAFE as the Associate Dean for Research, but left that position and now has responsibilities as regular faculty in the Department, but with his position still funded by the College. The ETS position was not initially on a regular funded line. However, when another Extension faculty member left the department, her funding supported the new Extension faculty member. The Department also experienced the untimely death of a Professor (RTS) in December of 2020, and he has not yet been replaced. Due to severe budget cuts mandated by the University and the College, insufficient funding is currently available to replace that vacant position. In fact, part of the funding from the vacant position was used to fully fund the new STS position.

Analysis of results and reflection: Since the last review, the Department has gained one funded STS faculty line that, although not in the title series specified in this recommendation. The faculty member serves a significant role in instruction of courses inside and outside the department and also holds extensive administrative responsibilities for undergraduates through the Ag. and Med. Biotech. program. The hire of this faculty member has significantly increased the investment of the department in undergraduate education, and through his activities has facilitated greater involvement by others. Many of whom seek research or extension internships in the Department. Also, because the additional RTS faculty member is funded from College administration rather than in the Department budget, and also because the vacant RTS line has insufficient funding to be filled, there has been an overall erosion of the RTS contingent rather than an increase as recommended.

Ongoing improvements: The Department considers it a priority to recruit additional RTS faculty to broaden its research and instructional base, and additionally has a need for another ETS position.

2. Identify relevant laboratory space for the new faculty hires

Assessment Method: Change in laboratory square footage available, and in quality of the facilities.

Results: Prior to the December 2021 tornado, the Extension title series faculty members had a significant increase in quantity and quality of available laboratory space. Two Extension faculty members in the Lexington campus share a laboratory in PSB, which was expanded by converting half of the adjoining room from office to laboratory space, with the desks replaced by laboratory benches. The result was an increase from 435 sq. ft. to 725 sq. ft., a 67% increase. On the Princeton, KY campus, with the development of the Grain and Forage Center of Excellence at UKREC, the facility has undergone a major renovation. There, the space dedicated to Plant Pathology (two Extension faculty members) remained the same but was overhauled and upgraded. Furthermore, with the provision of a molecular biology laboratory shared with other departments, the available space for the Plant Pathology programs has effectively increased by approx. 50%.

Analysis of results and reflection: Progress has been substantial for the four ETS faculty members. However, no new space has become available for RTS faculty members in the Department. In fact, space has become even more of a premium because of the success two years running in obtaining competitive federal funds for major new equipment items; a super-resolution confocal microscope and a liquid chromatograph-qTOF mass spectrometer (LC-MS). These initiatives, though multi-unit, were

spearheaded by Plant Pathology with the understanding that the instrumentation would be housed in the Department.

Ongoing improvements: Regular title series faculty members continue to struggle to find adequate space for their programs and especially for new equipment. This is a continuing priority consideration in the Chair's discussions with the College Administration.

3. Provide startup funds for the new faculty hires, including adequate funds for major equipment.

Assessment Method: Results of negotiation with new faculty hires.

Results: In connection with the new faculty hire in 2017 (ETS), startup funds were provided by the College to help with technical support, equipment, and current expense over the first three years from her start date. Also, in connection with the new faculty hire in 2021 (STS), modest startup funding was provided by the College and the Department.

Analysis of results and reflection: The College and University have recognized and accommodated the needs of the new faculty members hired into the department.

Ongoing improvements: For future hires, needs for startup funds will depend on distribution of effort and job responsibilities, especially in basic and applied research components. Therefore, negotiation of startup funds will continue to be an integral part of the hiring process.

4. Replace plant growth chambers with current, more efficient models, particularly in the containment suite.

Assessment: Availability of growth chambers to accommodate the needs of research and extension (applied research) programs.

Result: Three Conviron PGC-Flex plant growth chambers were purchased in 2016. All are in 2-tier configuration, totaling 228 square feet in usable growth space. Also, a nonfunctioning walk-in chamber in PSB was repaired in 2020.

Analysis of results and reflection: The new growth chambers will allow studies of pathogens of rice, maize and sorghum with BSL2-level containment, greatly enhancing prospects for research, student training, and funding of the program.

Ongoing improvements: Although the recent addition of three chambers has addressed this goal, as other growth chambers age they will need to be replaced. The suite of containment chambers in the Plant Sciences Building is now 18 years old, and their replacement should be considered if funds can be identified.

5. Avail institutional resources that have been implemented to help increase applications from traditionally underrepresented minorities.

Assessment: Staff members, faculty members and students from traditionally underrepresented minorities.

Results: The Department has seen an increase in staff and faculty diversity from 2016 to 2020, followed by a decrease in 2021 roughly back to the 2016 levels; Graduate Student diversity has increased. At both the staff and faculty levels, both progress and setbacks were experienced such that little change was ultimately realized in the demographics. Currently, with respect to the 11 domestic graduate students in Plant Pathology, two are Minority, and nine are White. Two of the students are Hispanic. The current graduate student class also includes two students from Brazil, five from China and one from Japan. By gender, the Department has 8 female and 11 male graduate students. The Department has not discriminated on the basis of sexual orientation and has included members of the LGBT community within the past six years.

Analysis of results and reflection: The recruitment of an African-American female to the office staff was a positive move toward the goal of parity for underrepresented minorities. Unfortunately, she ultimately resigned. Because the administration has approved advertising for a new staff member in

that position, there is potential to recover some staff diversity depending on whom is hired. Current demographics of Faculty Members are: 33% female and 17% Asian American. Among traditionally underrepresented groups, no African-Americans and no Hispanics are on the faculty.

Ongoing improvements: The Department is committed to enhancing diversity among faculty, staff, and students. Attention must be given to improving retention, particularly of traditionally underrepresented minorities. The same applies to graduate students, who continue to be relatively diverse even among the U.S. nationals. Continued effort recruiting women and minorities is desirable.

6. Develop a comprehensive graduate student orientation program for both domestic and international students.

Assessment method: Participation of graduate students in ongoing (PPA 784) and new (PPA 770) orientation programs.

Results: The PPA 784 course continues to be taught each Fall term to all incoming graduate students (four in 2016, three in 2017). This course provides an overview of both the M.S. and Ph.D. programs, an introduction to library and database resources, tutorials on graphics and bibliographic software that is licensed to the University, best practices for laboratory research, notes and records, and scientific ethics. Also, the seminar course, PPA 770, has been altered to involve more formal exercises, including draft and final Abstracts, and two practice seminars, with the final seminar including the complete slide shows in ppt or pdf format. The instructor provides timely feedback on all exercises. The new format for PPA 770 has been in effect since 2016 as a degree requirement for all Plant Pathology graduate students.

Analysis of results and reflection: In general, students and faculty seem satisfied with the results of the new PPA 770 format. Formal student feedback on PPA 784 was discussed in a department meeting (18-SEP-2017). It was concluded that course material is most effective if the skills taught in the course are utilized quickly in their lab work or in other courses.

Ongoing improvements: The faculty decided that it would be most beneficial if other department courses and research activities are structured such that the skills taught in PPA 784 are reinforced by lab and course exercises as early as possible in their programs.

7. Promote an active social committee to foster interactions among all members of the department.

Assessment method: Meetings of the social committee, and social activities.

Results: The Association of Plant Pathology Scholars (APPS) includes the graduate students and postdocs in the department, and organizes many of the social events. APPS has met 1-2 times each quarter. In addition, prior to the pandemic, APPS held three annual events: a breakfast and two dinner cookouts. The department also holds its annual winter holiday luncheon (except during the pandemic), which is organized mainly by the staff and APPS leadership. Other parties such as baby showers and retirement parties are also held when it is appropriate and safe to do so.

Analysis of results and reflection: Within the limitations of time and resources, the Department has maintained an active social environment. All groups within the department are involved, and especially the enthusiasm of graduate students to organize and run events has been gratifying.

Ongoing improvements: With the many professional and personal demands on the time of all members of the Department, it is difficult to envisage increasing social activities. Members of the department continue to be encouraged to participate. APPS continues to be very active.

8. Develop plans to promote travel to professional meetings by all graduate students in the department.

Assessment Method: Proportion of PPA Graduate Students attending and presenting at scientific meetings each year, and number of meetings and presentations by each student.

Results: Each year (until the COVID-19 pandemic) the department has had an increase in Graduate Student participation in meetings. In 2019, 11 Graduate Students attended a total of 17 national or regional meetings. Students advised by Faculty Members in the Extension title series have also been attending and presenting in extension meetings and events.

Analysis and reflection: The dramatic positive trend in participation was interrupted by the COVID-19 pandemic, although some participation of virtual meetings continued. We hope to meet or exceed the 2019 levels of participation at regional and national meetings once it becomes sufficiently safe to travel.

Ongoing improvement: Nearly all faculty advisors have had students attend meetings. There is still some room to expand participation, so the students and their advisors are encouraged to continue identifying appropriate meetings, to plan for student presentations at meetings, and to utilize block grant funds to help defray the costs.

9. Examine new sources of funding to support in-state travel for extension faculty and develop plans with the Associate Dean for Extension to adequately fund the extension programs within the Department.

Assessment Method: Budget available for Extension travel.

Results: The Extension faculty in Plant Pathology have garnered far more funds, including funds available for travel, than ever before. The increase is due to gifts and grants, including substantial salary savings on grants.

Analysis and reflection: The increased availability of funds has greatly benefited the Extension program. A concern, however, is that it is more difficult to obtain needed funding for travel for programs or commodities that have less opportunity for grant funding compared to others.

Ongoing improvement: The most desirable change, from the perspective of the Department, is a boost in funding from the College for travel and operating expenses for the Extension program. Nevertheless, the Extension team cooperates to ensure that available funds provide for basic program needs of the entire Plant Pathology Extension program.

10. The Department should discuss with the college administration possible financial support for undergraduate research projects, where such support can aid in graduate student recruitment directed towards underserved minorities.

Assessment Method: College and University support for students in traditionally underserved minorities.

Results: Funding was not obtained specifically for underserved minority Undergraduates conducting research internships. However, small amounts of funding are available from University programs, and the Faculty Members have been successful in funding Undergraduate internships from their grants. It is also notable that a Faculty Member established a collaboration with the Carter G. Woodson Academy, providing internships to African-American and Hispanic High School Students. Of those interns, at least two have enrolled in the University, one at CAFE and the other in A&S. Four others have enrolled in colleges and universities (three of them in Kentucky). With regard to Graduate Students, the College and University have assisted with financial support to help in minority recruitment. Currently, two Hispanic students, one of whom is a White female, and the other is a Minority male, have partial support from the College and University, with the remainder of support from grants and the Department.

Analysis of results and reflection: Considering that this recommendation is directed toward “graduate student recruitment,” the key consideration is diversification of the graduate class, especially with respect to traditionally underserved minorities. The program’s domestic Graduate Student body now stands at 18% Hispanic and 9% Minority, indicating success in this endeavor. However, with a small number of domestic students overall (currently 11), those demographics may alter substantially in any direction in future.

Ongoing improvement: The Department will continue to strive for greater minority recruitment, and hopefully the College and University will continue to reward success in this endeavor.

11. Encourage Faculty to take sabbatical leaves to improve their skill sets and refresh their perspectives on their careers.

Assessment Method: Numbers of Faculty Members considering and taking sabbatical leave.

Results: One faculty member took a year-long sabbatical funded by the Jefferson Science Fellow program of the Department of State and US-AID. This was achieved through a highly competitive application process.

Analysis of results and reflection: Faculty sabbaticals in this department have been far less frequent than the traditional once in seven years, largely because of family reasons.

Ongoing improvement: Difficulties in taking sabbaticals were discussed in a faculty meeting, and almost always have to do with family obligations. A recent sabbatical in another U.K. department (Computer Sciences) was described as extremely useful, so that is an option that more faculty might consider.

12. While the need for additional space may result in a college level analysis of space allocation, every effort should be made to keep the Plant Pathology research and extension faculty in the Plant Sciences Building.

Assessment Method: Space inventory.

Results: This goal was met. All Lexington-based PPA programs are based in the Plant Sciences Building, with the exception of the Plant Disease Diagnostic Laboratory (PDDL), which is based in the greenhouse complex nearby. The Department has two Extension faculty members and a second based at UKREC and Grain and Forage Center of Excellence in Princeton, Kentucky, which is appropriate for their commodity responsibilities (grain and oilseed crops).

Ongoing improvement: As the Department grows, discussion continues with the College administration to keep the physical coherence of the unit.

13. Not applicable; Original suggested goal was rejected.

14. Increase Master's Program degrees conferred.

Assessment Method: Track numbers of students enrolled, and degrees conferred in the Plant Pathology Master's Program over a five-year period. The target is three degrees per year beginning in 2021, resulting in 15 degrees produced over 5 years by 2026.

Results: The Department implemented a Plan B (non-thesis) M.S. program in 2019. This option has not yet been used. Numbers of M.S. degrees awarded by the Department were zero (0) in AY 2017, one (1) in AY 2018, zero (0) in AY 2019, one (1) in AY 2020, and three (3) in AY 2021. Currently, three (3) students are enrolled in the M.S. program. All of these students were or are in the thesis (plan A) option.

Analysis of results and reflection: The department has experienced a gradual increase in the number of M.S. degrees and students since the previous program review. Considering that all of those were thesis-based M.S. programs, the advantage of the new non-thesis M.S. offering has not yet been realized. However, considering that the option was only made available two years ago, there has not yet been sufficient time to judge its effectiveness in increasing demand for M.S. degrees from the Department. The expectation is that total numbers of M.S. students will increase after the pandemic abates.

Ongoing improvement: The department continues to reach out to prospective applicants who may be interested in the M.S. plan A or plan B option. A 4+1 program in Plant Pathology was also considered. but the Department perceived no demand for such an option at this time.

Appendix 2

Dual Doctoral Degree with UFV in Brazil

Overview

Beginning in 2016, prospective students can apply to enter the dual Doctoral degree program, administered jointly by the Department of Plant Pathology at the University of Kentucky (UK) and the [Departamento de Fitopatologia](#) at the Universidade Federal de Viçosa (UFV) in Brazil.*

Dual degree students will acquire academic credits and develop part of the research for their Doctoral dissertations at the partner university. A stay of at least 12 consecutive months at the partner university is required. Students who successfully complete this 4- to 5-year program will obtain Doctoral degrees in Plant Pathology from both UK (Ph. D. degree) and UFV (D.Sc. Degree), certified by diplomas issued by the two institutions. Students will develop language skills in English and Portuguese and become familiar with norms of the discipline in both countries. Students will simultaneously fulfill the academic requirements of both institutions in order to obtain degrees from both. The goal is to prepare students to work across borders, in academic, government, or industry settings.

*Depending on availability of funding.

Requirements to Enter the Dual Degree Program

- Basic requirements are the same as those for entry into the standard Ph.D. programs at UK and at UFV.
- Prospective students from Brazil will be required to obtain a passing grade on the TOEFL or IELTS tests. There is no language requirement for U.S. students wishing to participate in the program, although an ability to speak Portuguese or Spanish would be helpful.



The main building on the campus of the Universidade Federal de Viçosa



The Universidade Federal de Viçosa attracts students from all over the world.

Background

Diseases of plants cause significant crop losses worldwide. Many plant diseases are cosmopolitan in their distribution, and many others are introduced to new regions and initiate epidemics each year. Plant Pathology is, consequently, a global activity, and graduate education in this discipline should promote

the development of a workforce that is diverse and globally-engaged. Employees that can function effectively across borders are in demand by business, academia, and government agencies. Brazil is a major agricultural producer and international supplier of agricultural commodities. It also represents a huge market for U.S. agricultural products and technology. Most of the major multinational agricultural corporations have significant presences in Brazil. Brazil has an active research community working in support of its agricultural enterprise. The state-sponsored universities and research institutes are extremely well equipped and staffed with a highly educated workforce. Brazil is a geographically, culturally, and economically diverse country that offers a unique international experience for U.S. students. Educational exchanges are likely to be mutually beneficial for U.S. and Brazilian researchers, and to lead to faster progress in solving problems of mutual interest.

[UFV](#) was established in 1926 based on the U.S. land grant college model, and its educational system is similar to that of U.S. universities. Its first president was Dr. Peter Henry Rolfs, originally from the University of Florida, who established UFV's long tradition of collaboration with international institutions. UFV has played a major role in the development of Brazilian agriculture. It has trained several generations of plant and agricultural scientists now working at other universities and at Embrapa, Brazil's largest agricultural research institution. UFV is consistently ranked as one of the top agricultural schools in Brazil. Furthermore, UFV provides a welcoming environment for international students: students from dozens of countries worldwide study there each year. The UK International Center recently selected UFV as one of only nine foreign universities worldwide, and the only one in the Western hemisphere, to be a key partner in future internationalization initiatives. For more information about the experience of studying at UFV, view this [video](#) (in English).

The Department of Plant Pathology ([Departamento de Fitopatologia](#)) at UFV consists of 18 faculty members engaged in a broad range of basic and applied research. The faculty has an excellent international reputation and a collective research focus on disease management, particularly via sustainable methods (e.g. biological control). Many of the faculty earned their Ph.D. degree at a U.S. or European university, and all participating faculty have research experience in the U.S. or Europe and speak English. The department is housed in a modern building on the UFV campus that is well equipped for all types of research.

The Department of Plant Pathology at UK has consistently been ranked among the top five departments for Plant Pathology research in the United States. The research faculty members are internationally known for their basic studies of the mechanisms of plant-microbe interactions, and they attract talented graduate students from all over the world. The outstanding Extension faculty members are engaged mostly in applied disease management research that is focused on the needs of Kentucky growers, and some of them have extensive international experience in their own right.

These two strong departments complement one another very well in their respective strengths and resources. The dual degree student would be able to draw on the particular strengths of both in order to obtain a well-rounded education in Plant Pathology, as well as a working familiarity with a broad range of crops and diseases, and with both cultures and languages. We anticipate that graduates of this program would be highly competitive for jobs in both the U.S. and Brazil.

Curriculum

The recommended core curriculum for the dual degree program provides a rigorous and comprehensive education in both basic and applied Plant Pathology, with an emphasis on critical thinking, communication, and research methodologies.

Core Courses for the Dual Degree: 24-25 hours (PPA are courses at UK, FIP are courses at UFV).

- Population Biology (1-3 credits) [PPA 641 (1 credit) OR FIP 680 (3 credits)] (Lectures and Labs are in English)

- Disease Diagnosis (3 credits) (PPA 640)
- Critical Research Methods (3 credits) (PPA 600)
- Physiology of Plant Health and Disease (3-4 credits) (FIP 701, OR PPA 500 (3) and PPA 673 (1))
- Mycology (3 credits) (FIP 610)
- Bacteriology (3 credits) (FIP 640)
- Virology (3 credits) (FIP 630)
- Nematology (3 credits) (FIP 620)
- Seminar (1 credit) (PPA 799)

A three-credit statistics course is a pre-requisite to the program, and can be taken concurrently.

Example of Coursework (U.S. student)

An example of the program of coursework for a U.S. student entering the dual degree program with a B.S. in Plant Science or other relevant STEM discipline is provided, below. Semesters spent at UFV are 2:2 and 3:1 (bold font).

<i>Yr: Semester</i>	<i>1:1</i>	<i>1:2</i>	<i>2:1</i>	<i>2:2²</i>	<i>3:1</i>	<i>3:2</i>	<i>4:1</i>	<i>4:2</i>
Classes	PPA 500 A&S 103 ¹	PPA 641	FIP 640	FIP 620	PPA 767 ⁵	767	767	
	PPA 794	PPA 794	PPA 673	PPA 794³	PPA 794³			
		PPA 799	A&S 104 ¹					
			PPA 794 ³					
Total Graduate Credit	6	9	9	9⁴	9	2	2	2

¹Portuguese levels 1 and 2. In addition to taking these courses, the students will improve their conversational abilities by engaging with their visiting Brazilian counterparts in the dual degree program.

²Students will enroll in a noncredit six-week intensive Portuguese course upon arrival in Brazil in January.

³PPA 794 is Dissertation Research. The student will receive credit for this course based on independent research performed in the host laboratory. This research will be part of a collaborative project between the host laboratory and the student's home laboratory, and will comprise part of the student's dissertation.

⁴Nine credits for the FIP courses will be transferred.

⁵Post-qualifying research credit.

Example of Coursework (Brazilian student)

An example of the dual degree program of coursework for a Brazilian student entering with an M.S. degree¹ follows, below. Semesters spent at UK are 2:2 and 3:1 (bold font)

<i>Yr: Semeste</i> <i>r</i>	<i>1:1</i>	<i>1:2</i>	<i>2:1</i>	<i>2:2</i>	<i>3:1</i>	<i>3:2</i>	<i>4:1</i>	<i>4:2</i>
Classes	FIP 701	FIP 630	FIP 610	PPA 600	PPA 640	QUALS	PPA 749	Research
	PPA 680	FIP 640	FIP 620	PPA 794	PPA 794	PPA 767		PPA 767
			Elective	PPA 799	Research			
Credit			9 UK credit	9 UK credit	2 UK credit	0 UK credit		2 UK credit

¹Students will be required to have completed a M.S. before beginning the dual degree Doctoral program, already a requirement for entry into the doctoral program at UFV. This will substitute for one year of the required pre-qualifying residency for the UK degree. Prior to coming to UK, students will need to achieve a score of 79 or higher on the TOEFL.

Appendix 3

Courses Instructed by PPA Faculty Members or PPA Cross-listed

ABT 101 INTRODUCTION TO BIOTECHNOLOGY (3 cr.; coordinating co-instructor Hirsch). Exploration of historical perspectives, current applications, and future directions of biotechnology through experiential education with an emphasis on cohort building and teamwork.

ABT 120 GENETICS AND SOCIETY (3 cr.; primary instructor Hirsch). Practical exposure to molecular biology through laboratory experimentation in addition to developing scientific writing, critical thinking, and information literacy skills.

ABT 301 TECHNICAL WRITING AND PRESENTATIONS IN BIOTECHNOLOGY (2 cr.; primary instructor Bennett). Learning effective communication strategies for written and oral presentation formats to prepare students for their independent research project.

ABT 395 INDEPENDENT STUDY IN BIOTECHNOLOGY (3-4 cr.; primary instructor A. Kachroo). Student-led independent research project that culminates in a class-wide, oral presentation symposium.

EXP 396 CREDIT-BEARING PROFESSIONAL INTERNSHIP (1-9 cr.; primary instructor Hirsch). Student-led professional internship with professional development and career readiness reflections.

GEN 300 APPLIED BIOINFORMATICS (3 cr.; co-instructor Farman). A practical course that focuses on bioinformatics from a biologist's perspective, harnessing cutting-edge software approaches to query genomic databases.

NRE 390 ADVANCED SCUBA CERTIFICATION AND CORAL REEF ECOLOGY (3 cr.; primary instructor Hirsch). A study abroad course focusing on earning advanced scuba certifications and cataloging the ever-changing ecology of tropical ocean communities while exploring the Mesoamerican Barrier Reef.

PPA 300 GMOS: FACTS, MYTHS, AND THEIR IMPACT (3 cr.; primary instructor Hirsch). An introduction to the processes and products of genetic modification in agriculture and medicine, and an exploration of the impacts of genetic engineering on aspects of society ranging from applied agronomy and cancer treatments to international trade and patent law.

PPA 395 INDEPENDENT STUDY IN PLANT PATHOLOGY (1-4 cr.; multiple primary instructors). Independent study in Plant Pathology under the supervision of a faculty member. [Student Research Contract Sheet for PPA 395](#)

PPA 400G PRINCIPLES OF PLANT PATHOLOGY (3 cr.; primary instructor Hirsch). Significance, nature, causes, and methods of control of plant diseases.

PPA 500* PHYSIOLOGY OF PLANT HEALTH AND DISEASE (3 cr.; primary instructor A. Kachroo). Physiological and molecular aspects of plant biology underlying interactions of plants with microbial pathogens and symbionts.

PPA 600* CRITICAL METHODS IN PLANT-MICROBE INTERACTIONS (2 cr.; primary instructor Farman). Instruction on experimental methods commonly used in studies of plant-microbe interactions, and training in critical thinking, grant writing, scientific ethics, and oral presentation skills.

BCH/BIO...PPA 601 SPECIAL TOPICS IN MOLECULAR AND CELLULAR GENETICS (1 cr.; multiple primary instructors). Each spring semester, several distinguished scientists visit the campus to deliver a series of three formal lectures each, and to participate in numerous informal contacts with graduate students. Emphasis is on presentation of the most current advances (often unpublished) in selected topics in molecular and cellular genetics.

PSS/PPA 609 PLANT BIOCHEMISTRY (3 cr.; primary instructor in PSS). The chemical constituents of plants, their interaction, and the regulation of their interaction, in key plant metabolic systems will be studied. Included in the course will be discussions of photosynthesis, nitrogen fixation, nitrate reduction, nitrogen assimilation, plant growth and its regulation, and the structure and metabolism of constituents unique to plants.

PPA 620 FUNGICIDES, ADVANCED CONCEPTS (3 cr.; primary instructor Vincelli). An in-depth exploration of diverse factors that affect field performance of fungicides, as well as environmental and toxicological dimensions of these disease-control chemicals.

PPA 630 INTRODUCTION TO GENETICALLY ENGINEERED CROPS, RISKS & BENEFITS I (1 cr.; primary instructor Vincelli). This is Part I of a two-part series of graduate-level courses exploring GMO (genetically engineered) crops. In Part I, students will be introduced to what GMO crops are; and how they are similar to, and different from, other crops.

PPA 631 INTRODUCTION TO GENETICALLY ENGINEERED CROPS, RISKS & BENEFITS II (1 cr.; primary instructor Vincelli). This is Part II of a two-part series of graduate-level courses exploring GMO (genetically engineered) crops. In Part II, students will explore perceived risks and benefits to the use of these technologies.

PPA 640* IDENTIFICATION OF PLANT DISEASES (3 cr.; primary instructor Vaillancourt). Recognition and identification of plant diseases and their causes and development. The course is designed to give each student practical experience in dealing with a wide array of plant diseases, symptom expressions, causal agents, and interactions with environmental factors encountered in the field.

PPA 641* PLANT DISEASE, POPULATION BIOLOGY, AND BIOTECHNOLOGY (1 cr.; primary instructor Schardl). To understand implications of deployment of biotechnology and other disease management practices at the level of host and pathogen populations.

PPA 650 FUNGAL BIOLOGY (3 cr.; primary instructor Vaillancourt). Advanced study of fungi and of the fungal life cycle and life style (including metabolism, developmental biology, cell biology, ecology, and reproductive processes).

PPA 670 PLANT BACTERIOLOGY (1 cr.; primary instructor Schardl). Bacterial mechanisms underlying pathogenesis and virulence in interactions causing plant disease, and symbiotic compatibility in mutualisms.

PPA 671 ADVANCED PLANT VIROLOGY (2 cr.; primary instructor Nagy). Molecular basis of plant virus infection of plants. Virus replication and spread. Virus control strategies.

PPA 673 ADVANCED PLANT DISEASE RESISTANCE (1 cr.; primary instructor P. Kachroo). Molecular mechanisms of disease resistance and signaling, focused primarily on model plant systems including *Arabidopsis thaliana*. [Course information](#)

PPA 700 PLANT PATHOLOGY LABORATORY VISITS (1-3 cr.; multiple primary instructors). A semester-long rotation in a laboratory other than the student's "home lab". This course provides an opportunity to apply experimental approaches commonly utilized in the host lab to the student's own research problems.

PPA 748 MASTERS THESIS RESEARCH.

PPA 768 RESIDENCE CREDIT FOR THE MASTER'S DEGREE

PPA 767 RESIDENCE CREDIT FOR THE DOCTOR'S DEGREE (2 cr.; multiple primary instructors). Required only for PhD candidates, and the major advisor is the instructor of record.

PPA 770* PLANT PATHOLOGY SEMINAR (1 cr.; primary instructor Bennett). Students enrolled in this course undertake a structured program of preparation and practice, culminating in a presentation during the regular department seminar schedule.

PPA 784* SPECIAL PROBLEMS IN PLANT PATHOLOGY (1–6 cr.; multiple primary instructors). Every Fall, a 1-credit section subtitled Graduate Student Orientation is required for incoming graduate students, in order to acquaint them with expectations, resources (e.g., online journals, Web of Science, etc.) and software tools (Endnote, Adobe Illustrator, ImageJ, etc.) for their graduate work. This section is organized by the department Chair, and most faculty members contribute 1–3 sessions.

PPA 794 RESEARCH IN PLANT PATHOLOGY (1–9 cr.).

PPA 799 TEACHING IN PLANT PATHOLOGY (1–3 cr.; primary instructor Hirsch). This course is usually tied to a formal or informal Teaching Assistantship, such as for ABT 120.

STO 602 SCIENCE LITERACY AND TRANSLATION, (3 cr; primary instructor Bennett). Students will explore, translate and interpret scientific findings into application and policy, enhance their scientific literacy, and learn to evaluate the credibility of sources of scientific information.

STO 650 CAPSTONE IN SCIENCE OUTREACH AND TRANSLATION (3 cr; primary instructor Vincelli). Students in this course use principles of science translation and outreach to (1) Identify an issue of public concern; (2) Design an original, evidence-based outreach program to address the concern; (3) Create a program implementation plan; and (4) Develop an evaluation plan for the program.

Appendix 4. Extension Program Highlights

Documentation of New Disease Issues (PPAEXT Team)

Monitoring for new or emerging disease issues is a key contribution of PPA Extension faculty and the Plant and Pest Diagnostic Laboratory. Detecting and confirming new diseases requires multiple steps in both the field and laboratory to confirm the disease and causal organism. In all cases we work with state and federal regulatory agencies and national diagnostic networks to make sure these findings are documented appropriately. Effective and timely diagnosis of new disease issues helps protect Kentucky agriculture and ensures we can properly monitor and research the effects of these new diseases on agricultural production. In the last 5 years, we have confirmed multiple new diseases in field crops, such as corn, soybean, and small grain crops, as well as in horticultural crops and forest trees. Recent finds of tar spot on corn and red crown rot of soybean could have major implications for field crop farmers in the state since these are important yield-limiting diseases in other states. Documentation of recent new disease confirmations is below.

- Tar spot of corn (caused by *Phyllachora maydis*), found for the first time in Kentucky in 2021
- Red crown rot of soybean (caused by *Calonectria ilicicola*) found for first time in Kentucky in 2021
- Spot blotch of rye (caused by *Bipolaris sorokiniana*) found for first time in Kentucky in 2018
- Curvularia leaf spot on corn (caused by *Curvularia lunata*) confirmed in Kentucky in 2018
- Documented new races of *Phytophthora sojae*, causal agent of Phytophthora root and stem rot of soybean in Kentucky
- Laurel wilt disease (caused by *Raffaelea lauricola*) in native forest species (sassafras and spicebush) confirmed in 2018 with further expansion documented in 2020-21

Exploring Challenges to Sustainability in Food Systems (Vincelli). Programming explores diverse themes, such as climate change, soil health, pesticides, externalized costs of agriculture, infectious diseases, social dimensions of food systems, and much more. Vincelli currently serves as Liaison for the Southern Region Sustainable Agriculture Research and Extension (SARE) Program to the 1862 Land Grant Universities. An important outlet for these explorations include a new podcast series, [Questions in Sustainability](#).

Online M.S. Program in Science Translation and Outreach (STO)(Vincelli). Vincelli was invited by the CAFE administration to lead the creation of a fully online curriculum designed specifically to help all agents achieve their M.S. degree. The committee was given 20 months to create, and shepherd through the full approval process, a new curriculum, which was achieved without requesting new faculty. Since the onset of enrollment in Fall 2019, Vincelli has served as Director of Graduate Studies and has taught the capstone course, STO-650: *Capstone in Science Translation and Outreach*. The principal objective of this new curriculum has been to provide graduate-level professional opportunities for Extension agents, no matter their disciplinary background. Over 30 students are enrolled or graduated, almost all being Kentucky Extension agents.

Outreach on Risks and Benefits of Genetically Engineered Crops (Vincelli). Many Extension agents have felt unprepared to provide significant levels of programming on genetically engineered because of the complexity of the subject and its dynamic nature. Under a CAFE directive, new Extension materials (publications, presentations, videos, training programs) were developed to meet agent needs. Presentations ranging from the county-based level through to regional and national talks and webinars were created and shared with diverse audiences. A two-part online, synchronous course series (PPA-630 and PPA 631: Introduction to Genetically Engineered Crops, Risks and Benefits I and II, one cr. each) was created and taught. Again, the principal stakeholder group for this course were

Extension agents, primarily to contribute to professional development and graduate studies of County Extension Agents.) An open-access review paper was written for wide audiences: Genetic Engineering and Sustainable Crop Disease Management: Opportunities for Case-by-Case Decision-Making, in the journal Sustainability, 2016 (16,910 full-text views, 16 citations). This is basically serving as a global Extension effort, though the most important target audience for this publication is Extension agents.

Expanding Global Perspectives in Extension and Teaching (Vincelli).

Like its benchmark universities, the University of Kentucky considers a global academic footprint to be fundamental to be a leading 21st Century university. One component of expanding the global engagement of the Extension program, a new graduate course was created, *Advanced Concepts in Sustainable Crop Production and Disease Management, Insights from Nicaragua* (Education Abroad, 2015, four credits, included three Kentucky Extension agents). Comments from participating agents indicated it was a life-changing experience. Vincelli was invited to serve for a year with the US Agency for International Development as a Jefferson Science Fellow (2019-2020). This experience was influential in teaching and DGS responsibilities in the STO Program, as well as in other ways. Although this is nowhere near a complete list of international experiences by the Extension Team, other formative international experiences include lecturing in China (2015-2016), and decades of pursuing research, teaching and Extension opportunities globally, which has served as a nearly in exhaustible source of diverse material for globally informed programming.

Fungicide Resistance Monitoring in Important Fungal Pathogens of Field Crops (Bradley and Wise)

Foliar fungicide use in field crops has increased greatly over the last decade. This increased use of foliar fungicides has resulted in an increased risk of development of fungicide resistant strains of important plant pathogens. With Plant Pathology Extension Faculty at UK leading state and national efforts, monitoring programs have been put in place to help identify strains of important plant pathogens with reduced-sensitivity or resistance to important classes of fungicides. These efforts have resulted in documenting strains of important soybean pathogens with resistance to quinone outside inhibitor (QoI) fungicides, which include QoI-resistant strains of the frogeye leaf spot pathogen (*Cercospora sojina*) in 21 states, QoI-resistant strains of the brown spot pathogen (*Septoria glycines*) in 3 states, and QoI-resistant strains of the target spot pathogen (*Corynespora cassiicola*) in Kentucky. This work also includes monitoring for resistance to other important classes such as the demethylation inhibitor (DMI), succinate dehydrogenase inhibitor (SDHI), and methyl benzimidazole (MBC) fungicides in these soybean pathogens. Fungicide resistance monitoring work on important pathogens of wheat include documenting resistance to QoI fungicides in Kentucky strains of the wheat leaf blotch pathogens, *Parastagonospora nodorum* and *Zymoseptoria tritici*, and determining the sensitivity of strains of the Fusarium head blight pathogen, *Fusarium graminearum*, from several wheat-growing states. Work on corn pathogens in this area has included determining sensitivity of the northern corn leaf blight pathogen (*Exserohilum turcicum*) to DMI fungicides and sensitivity of the gray leaf spot pathogen (*Cercospora zea-maydis*) to SDHI fungicides. Research on tobacco pathogens has identified resistance to QoI fungicides in *Cercospora nicotiane*, causal agent of frogeye leaf spot of tobacco, and streptomycin resistance has been identified in the bacterial pathogen *Pseudomonas syringae* pv. *tabaci*, causing angular leaf spot of tobacco. Based, in part, on this research, state and national extension publications and educational programs have helped raise awareness of this important issue. Overall, this work helps alert farmers about the risk of fungicide resistance in their area and helps them make important management decisions that will result in adequate disease management and the best fungicide resistance management practices.

Coordinating and Contributing to National Fungicide Resources (Wise, Bradley, Vincelli)

Many questions remain about optimizing fungicide use and managing diseases in grain crops. UK plant pathology grain crop Extension Specialists provide unbiased research-based information that can be used to improve disease management, while educating clientele on the most efficacious and economical ways to use fungicides. Dr. Wise and Bradley work with colleagues across the U.S. and Canada to develop multi-state and national resources that improve the quality of available information on fungicides. Many of these resources are housed at the national Extension platform, the Crop Protection Network (CPN; www.cropprotectionnetwork.org). Dr. Wise also coordinates and collects national data on efficacy of currently marketed fungicides for common diseases of corn and soybean, and coordinates corn uniform fungicide efficacy trials conducted across 12 states and Ontario, Canada. These efforts have resulted in Extension fungicide efficacy tables that are the first of their kind available in North America. Plant pathology colleagues in 18 states use these tables, which are distributed or viewed nationally by approximately 80,000 people annually through CPN and individual state websites. Recently Drs. Wise, Bradley and Vincelli coordinated an article on the impact of agricultural fungicides on fungicide resistance development in human medicine (doi.org/10.31274/cpn-20211011-000). At the time the departmental review document was drafted, the fungicide resistance article had been published online for only 7 days but had already been viewed over 1,000 times.

Extension Education Efforts on Field Crop Diseases Caused by Nematodes (Bradley and Wise)

Nematodes that affect field crops, such as soybean and corn, can cause large yield reductions to farmers in Kentucky and the region. The soybean cyst nematode (SCN) is considered to be the most destructive pathogen of soybean in the U.S. In 2019, SCN caused an estimated loss of over 77 million bushels in the U.S., with an estimated loss of over 2 million bushels in Kentucky. These bushels lost were worth over \$673 million in the U.S. and over \$18 million in Kentucky. Other nematodes, such as the reniform, root-knot and root-lesion nematodes have been documented to cause large soybean yield reductions in some states, but their presence in Kentucky soybean fields had not been well-documented. A soybean nematode field survey was implemented in 2019 to determine the percentage of Kentucky soybean fields infested with SCN and other nematodes that can affect soybean. This survey, conducted in part by County Extension Agents, revealed that 84% of the fields tested were infested with SCN. This survey also identified the presence of lance, root, lesion, and spiral nematodes in Kentucky soybean fields. Several extension educational events were conducted to educate stakeholders about these findings and the best practices available for management of these important nematodes. Trainings included some directed specifically for County Extension Agents (“Train the Trainer” events) and for other stakeholders, such as farmers, crop consultants, industry personnel, commodity boards, and governmental agencies.

Several different species of nematodes have the potential to be yield-limiting pests of corn, causing an estimated loss of nearly 63 million bushels worth over \$235 million in the U.S. in 2019. However, there have been no previous comprehensive surveys to understand the presence and distribution of nematodes that can affect corn in Kentucky. In 2019 and 2020, 20 and 16 Kentucky counties were surveyed, respectively, by County Agents for corn nematodes. At least three samples were submitted per county, for a total of 144 samples examined for species and level of plant parasitic nematodes. Only one field had no nematodes detected, in 2019. At least one species of nematode was detected in all other fields each year, with spiral, lesion, and lance nematodes detected most frequently. Stunt nematodes were detected in more fields in 2020 compared to 2019. Damaging species such as needle, stubby root, and root-knot nematodes were not detected in any samples. Nematode levels and species varied widely across the sampled counties, and within a county. These results are being analyzed and will be distributed to Agents to help with questions about nematodes that can affect corn in their counties.

University of Kentucky Crop Scouting Competition (Wise)

The University of Kentucky High School Crop Scouting Competition, coordinated by Dr. Wise, was established in Kentucky at the UK Research and Education Center and has been held every year in person, or virtually, since 2019. Teams of high school students, led by Kentucky high school agriculture teachers and County Agents, participate in hands-on exercises focused on basic corn and soybean agronomics, pest ID (weeds, insects, diseases), field scouting and sprayer calibration. All activities focused on improving students' awareness of real-world decision-making in agriculture. Judges, primarily university Extension specialists and graduate students, score teams based on the students answers to various questions and provide students with real-time feedback to make the event an educational opportunity. Monetary prizes are awarded to the top three teams with the highest scores. The first and second place teams represent Kentucky and compete in the national crop scouting competition. In all years, 100% of student participants and team leaders indicated that they had a positive experience with the crop scouting competition.

University of Kentucky Crop Pest Management Webinars (Wise and Bradley)

In 2020, traditional meetings on field crop pest management were cancelled due to COVID-19 restrictions on in-person events. The field crop pest management group at UK, led by Dr. Wise, developed a 5-week webinar series in November and December of 2020 to provide stakeholders with research-based information, and provide Certified Crop Advisor continuing education credits, Agent In-service training, and pesticide applicator training to clientele. Webinar series speakers and topics included Dr. Carl Bradley and others from the field crop pest management team. These webinars were hosted by the Southern IPM Center and had over 200 attendees in total. In addition to local stakeholder and Agent attendees, each webinar had national and international attendees, and multiple people attended more than one webinar in the series. The series will be repeated in 2021 due to high demand and requests for similar trainings.

Optimizing Spray Nozzles for Improved Fungicide Management of Fusarium Head Blight of Wheat (Bradley)

Fusarium head blight is the most important disease of wheat in Kentucky and the surrounding region. Foliar fungicides are used to help manage this disease, but efficacies are relatively low due to the challenge of achieving proper coverage on a vertical target (the wheat head). In collaboration with Dr. Tim Stombaugh (UK Agricultural Engineer) and with funding from the KY Small Grain Growers Association, spray nozzle configurations and application speeds were optimized to achieve the best what head coverage with fungicide. This has led to improved efficacy of fungicides and improved management of Fusarium head blight.

Bradley Extension Plant Pathology Program

Dr. Carl Bradley has statewide extension and applied research responsibilities for disease management in soybean and small grain crops (barley, rye, and wheat). These crops are planted on over 2 million acres annually in Kentucky, worth approximately \$1.0 billion to \$1.3 billion annually (2016-2020). He came to the University of Kentucky in July 2015 and is based at the UK-Research & Education Center in Princeton, KY. Since arriving to UK, Dr. Bradley has been awarded over \$2 million in competitive grants and industry-supported funding, has published 75 peer-reviewed journal articles, 4 book chapters, and 52 extension publications. He has given over 100 face-to-face and virtual presentations while at UK, reaching thousands of stakeholders and clientele from Kentucky, across the nation, and abroad to several countries. He currently co-advises 3 graduate students and is a committee member on three graduate students committees across two departments at UK and at the University of Nebraska. He has graduated one M.S. student from his program at UK and has mentored eleven undergraduate students.

Wise Extension Plant Pathology Program

Dr. Wise joined UK in 2017, at the University of Kentucky Research and Education Center in Princeton, KY, with responsibility for research and Extension programs on corn, sorghum and forage diseases. Dr. Wise has authored or co-authored 35 extension publications and has published 37 peer-reviewed journal articles since her arrival. Dr. Wise has generated over \$875,000 in research grants and gifts and has given over 90 presentations since 2017, including over 20 invited presentations at national and international meetings. She advises two graduate students, co-advises three graduate students, and is a committee member on four additional graduate student committees across two departments, and has had 5 undergraduate interns in her program.

Efficacy of Drone-Applied Foliar Fungicide Applications in Corn (Wise)

Foliar fungicide applications have now become common in corn production and are often applied aerially by fixed-wing or helicopter applicators. Many fields in Kentucky are small and/or bordered by trees, limiting the ability to apply fungicides with commercial aerial application units. Drone applications may be a viable option for application of fungicides in these fields. On-farm research trials were established in Adair, Green, and Taylor Counties in conjunction with the County Agents to examine the impact of drone-applied foliar fungicides in comparison to non-treated controls. Fields were sprayed at the silking growth stages with fungicide, and non-treated strips were included for comparison. Foliar disease severity and yield data were collected. In all locations, fungicide applied by drone reduced disease severity. This research indicates that drone-applied fungicides can be a viable method for fungicide applications in corn. An Extension publication (PPA-50) summarizing the results was created to provide information and considerations for drone fungicide applications to stakeholders.

Train-the-Trainer: Helping County Extension Agents Solve Disease and Horticultural Problems (Gauthier). This program, developed and guided by Nicole Gauthier, recognizes that county agents serve as local contacts for growers and home gardeners, enhances their ability to serve stakeholders, and assures that agents can efficiently and effectively reach their stakeholders while delivering quality, non-biased recommendations. Training events and one-on-one interactions with agents are priorities in efforts to teach practical disease identification and management approaches. At least one major training event occurs each year, as well as a range of webinars, emails, one-on-one consultations, field visits, agent and grower references, fact sheets, and videos

Extension Program Hemp Compendium and Disease Guide: *Compendium of Cannabis Diseases* (Gauthier). This book, of which Gauthier is the originator, lead author, and editor, is part of a series published by the American Phytopathological Society. Crop-specific compendia are used by diagnosticians, researchers, educators, consultants, technicians, and other crop scientists as primary references for diseases and their causal agents. Publication/release date: September 1, 2021. apsnet.org. As research unfolds, more chapters will be added to the compendium. This first edition compendium includes co-editor Lindsey Thiessen (USDA-APHIS) and ten co-authors for the first nine chapters. As the hemp industry expands beyond one half million acres, this compendium will set industry standards.

Survey of Hemp Diseases in Kentucky: Analysis of Risk and Impact of Diseases on Field and Greenhouse Hemp (Gauthier)

This program, of which Gauthier is the primary investigator, undergraduate advisor, and graduate co-advisor, includes surveys and collections, conventional and molecular diagnostic services, applied research and fungicide trials, and student mentoring. This program was the first hemp pathology program in the US upon reintroduction of hemp agriculture in 2014. It remains the leading research and Extension hemp pathology program. Gauthier is Co-chair of the Southern IPM Hemp Working Group and Co-lead for the S1084 multistate working group project – Pest and Disease Focus Group. This program has produced confirmation of 25 diseases, 6 first reports; grower resources, fact sheets, and management guides

Characterization of *Bipolaris gigantea*, Causal Agent of Hemp Leaf Spot (Gauthier). This program, of which Gauthier (in collaboration with Schardl) is primary investigator and graduate co-advisor, explores morphological traits and phylogenetic classification of the causal agent of hemp leaf spot. This work enables management of hemp leaf spot using cultural practices and biological control agents. This program has produced a MS graduate, 3 peer-reviewed publications, and 1 publication in progress.

Hemp Powdery Mildew Under Greenhouse Conditions (Gauthier). Gauthier is investigator and undergraduate advisor in a statewide survey of causal species of the most common greenhouse disease of hemp. Research includes cultivar susceptibility screening and evaluation of synthetic fungicides and biological products. This survey has resulted in clarification and confirmation of pathogenic species and disease management recommendations.

Integrated Disease Management of Fruit Crops, with a Focus on Kentucky-Specific Issues (Gauthier). This program, of which Gauthier is primary investigator, faculty specialist, undergraduate advisor, and co-collaborator, includes agent and grower outreach and education with targeted applied research. Gauthier is Lead for the IPM Fruit Working Group.

Bitter Rot of Apple: A Closer Look at the *Colletotrichum* spp. That Cause Disease (Gauthier). This program, of which Gauthier (in collaboration with Vaillancourt), graduate co-advisor, and faculty specialist, characterizes *Colletotrichum* species that cause bitter rot of apple, ripe rot of blueberry, and anthracnose of strawberry. Research includes speciation of fruit rot fungi, distribution of species, and potential for cross infection across mixed orchards. This program has resulted in two MS degrees, 4 peer-reviewed publications; grower resources, fact sheets, and management guides.

Appendix 5. Regular Title Series Faculty Narratives

A. Rick Bennett, Professor

Rick Bennett serves as the Director of Graduate Studies (DGS) for the department. As DGS, he is responsible for administering the rules of the Graduate School as they pertain to the graduate programs of the department and ensures graduate students are making reasonable progress towards completion of their degree. He advises graduate students and serves as liaison between the Graduate School and the department. As such, Bennett recommends and approves the composition of graduate advisory committee members and administers qualifying and final exams.

Bennett's research activities are focused on efforts to manage and preserve plant associated microbial germplasm collections. He serves as Co-PI on a National Science Foundation, Research Coordination Network (NSF-RCN) grant that supports the U.S. Culture Collection Network (USCCN). The goals and objectives of this research are to address specific challenges and needs associated with collection management, distribution and practices that establish a web-accessible database of protocols, policies, and best practice guidelines. Special attention is to develop a formal back-up plan for active, orphaned, or endangered microbial collections.

Bennett serves as chair of the APS Public Policy Board (PPB) and provides other service activities to APS. The PPB is the advocacy and outreach arm of APS and engages in policy discussions with U.S. government agency administrators, other professional societies and organizations in the public policy-making process. Bennett provides guidance directly through the APS president and members of APS on research funding needs and the impacts of proposed rules and regulations in policy areas of relevance to plant pathology. Through the PPB, Bennett develops position papers, public comment on proposed rule changes, and provides scientific guidance through webinars, monthly meetings and special sessions on behalf of APS.

Bennett is instructor for ABT301, Writing and Presentation in the Life Sciences, Agriculture Biotechnology Program; STO602, Science Literacy and Translation, Science Technology and Outreach Program; and PPA770, Plant Pathology seminar, as well as portions of team-taught PPA courses.

Mark L. Farman, Professor

The Farman lab has three main research thrusts: The roles of telomeres in fungal genome evolution; fungal adaptation and speciation; and clonal variation in gene expression as a mechanism of pathogenic adaptation. He is currently PI on a multi-institutional project funded by the NSF Molecular and Cellular Biology program, which involves UK, Eastern Kentucky University, and Western Kentucky University. This effort involves exploring telomere dynamics and its impact on overall chromosome architecture. This project is unique in that it is a standard research grant but is using small, individual undergraduate research projects to meet most of the project's objectives. To date it has provided more than ten undergraduates as well as two graduate students with training and research experiences in bioinformatics. A recent publication in *Frontiers in Genetics* incorporated results from seven undergraduates and two graduate student trainees.

Under a recently completed USDA-NIFA project (PI: Barbara Valent), Farman's lab was able to unravel the complex evolutionary history of wheat blast (and another recently-emerged disease, gray leaf spot of *Lolium* grasses) to gain the most comprehensive insight into the evolutionary history and current population structure for any fungus (and perhaps any organism). Extended findings from this

project included the identification of a systemic flaw in widely-used variant-calling pipelines, and a major challenge to current thinking in fungal evolution.

The final main research area for the Farman lab involves exploring pathogenic variation among clonal individuals as a mechanism for pathogenic adaptation. This work was initially supported by an NSF EAGER award for exploratory research with potentially transformative impacts and led to the discovery of wide variation in gene expression among clonal individuals. Current work is focused on identifying the genes whose variable expression is responsible for the differences in pathogenicity.

Current competitive funding: NSF: \$724,625; July 1, 2017 - June 30, 2022 (PI); USDA-NIFA: \$570,000, Feb 1, 2021 - Jan 31, 2024 (Co-PI).

Funding history: Farman has had Federal competitive funding (as PI, or Co-PI) every year since 2001, including grants from USDA (PI: 1, Co-PI: 2) and NSF (PI: 3); a discretionary NSF EAGER award for potentially transformative ideas; an American Heart Association grant (Co-PI); a March of Dimes Basil O' Connor award (PI); as well as numerous awards from other competitive funding sources (USGA, Kentucky Technology and Research Development Corp. [3 awards], among others).

Publications: Farman has 72 refereed research publications, 4 reviews and book chapters, 62 other papers and articles, and 3 patents. He has an h-index of 38 on Google Scholar.

Laboratory: One Research Analyst position (also currently enrolled as a graduate student) (Hatch funding), one graduate student (departmental support), one postdoc (USDA-NIFA). The laboratory regularly provides research opportunities to variable numbers of undergraduate interns, most recently through a collaborative NSF project. Farman also co-supervises research efforts for a team of six undergraduates and a grad student at ECU, and an undergraduate at WKU.

Teaching: Farman teaches the 2-cr. required, graduate-level course, Critical Methods in Plant Microbe Interactions (PPA 600) (spring semester each year) ; a 3-cr. undergraduate-level course, GEN600/CS485G Applied Bioinformatics (spring semester each year); and contributes to PPA 500 (4 lectures) and PPA 784 (4 lectures) (both taught in the fall semester each year). Additionally, for the past 10 years, Farman has lead an annual, 5-day summer workshop on Bioinformatics (conceived and developed by Farman in collaboration with colleagues in the Computer Science department) which is attended by individuals from institutions (and occasionally businesses) from all over the Commonwealth. Participants have been at all academic levels ranged from high school students to faculty and number over 250 to date.

Aardra P. Kachroo, Professor

Aardra Kachroo's research aims to understand how plants perceive pathogens and how primary metabolic pathways interface with defense signaling. The long-term goal is to identify factors that can induce broad-spectrum resistance, without significantly affecting plant growth, development, and ultimately yields. Understanding how plant responses to pathogenic microbes overlap with plant interactions with beneficial organisms is also a key focus of the A. Kachroo program. This work benefits the United States agricultural economy because it is directly relevant to the second largest crop produced in the United States, soybean (*Glycine max*), and is applicable to other crops as well.

Systemic defense signaling in plants: Funded by the NSF and in collaboration with Pradeep Kachroo's group, we continue to dissect the molecular mechanisms underlying a unique form of whole-plant immunity called systemic acquired resistance (SAR). SAR is induced when localized primary infection by microbial pathogens results in the generation of systemically transported mobile signal(s), which prepare the uninfected parts of the

plant against future infections by a broad spectrum of pathogens. We have identified multiple mobile signaling components of SAR, demonstrated the importance of chloroplastic galactolipids in SAR induction. We showed that the cuticle plays a crucial role in SAR signal generation and perception and regulates the apoplastic transport of salicylic acid (SA) during SAR, and most recently identified a small RNA molecule as the crucial early signal of SAR. We also study the conservation of the SAR signaling components in soybean and other crop plants. Based on the multiple practical implications of our recent findings, the University has submitted a patent application protecting the underlying IP. A. Kachroo was selected for the Fall 2020 cohort of the university's Launch Blue UAccel program. The program offers professional development and an experiential learning opportunity to innovators in higher education to enable a viable commercialization path for their technology.

Defense signaling and pathogen recognition in soybean: Through various projects funded by the United Soybean Board (USB), Kentucky Soybean Promotion Board, and the Kentucky Science and Engineering Foundation, we have identified multiple components of soybean resistance (R) protein-mediated defense signaling pathways, as well as soybean factors that promote effector-induced pathogen virulence in soybean. For instance, we have identified soybean proteins that interact with the effectors of and/or transduce extracellular signals derived from the bacterial blight pathogen, *Pseudomonas syringae*. Additionally, we showed that the putative virulence determinant of soybean mosaic virus, targets a component of the soybean translation elongation complex to inhibit the unfolded protein response associated with viral defense. A current, multi-state, USB-funded project involves the identification of soybean resistance loci and defense regulator factors against water molds (*Phytophthora sojae* and *Pythium spp*), which cause devastating losses to the crop each year. These projects inform the development of sustainable and novel strategies to manage soybean and other related crop diseases.

In another NSF-SBIR Phase II funded project we are evaluating the disease protection efficacy of a nematode-derived product (Asc18) that is being developed for commercial applications by Ascribe Biosciences. We assay Asc18 efficacy against multiple soybean pathogens through seed formulations.

Signaling overlap during responses to pathogenic and beneficial microbes: Legume-rhizobia interactions are a form of symbiosis driven by the need for mutually exchangeable essential nutrients. However, such associations are highly strain-specific and in some cases regulated by proteins that resemble R proteins. We recently showed that strain-specific exclusion of rhizobacteria in the soybean root activates systemic signaling, which induces pathogen resistance in the shoot. Notably, root perception of incompatible rhizobia results in the accumulation of G3P, a key mobile inducer of SAR. The shoot synthesized G3P is essential for both root exclusion of rhizobia and foliar induction of pathogen resistance. In contrast, SA another essential component of SAR, is not required for root exclusion of rhizobia but is necessary for pathogen defense in foliar tissue. This implies a highly novel and previously uninvestigated role for G3P in regulating soybean nodulation-specificity. We are studying this novel signaling pathway involving G3P, which leverages root perception of undesirable rhizobia to induce broad spectrum systemic resistance against pathogens in the shoot. Besides unraveling the underlying signaling mechanisms, this work will elucidate how plants interact simultaneously with beneficial and pathogenic organisms, as would be expected in the natural environment. Understanding these unexplored aspects of legume-rhizobia interactions will inform strategies to improve nitrogen fixation while promoting pathogen resistance.

Pradeep Kachroo, Professor

Project 1: Systemic signaling in plants: One of the major projects in the P. Kachroo lab focuses on a unique form of whole-plant immunity called systemic acquired resistance (SAR). SAR is induced when localized primary infection by microbial pathogens results in the generation of systemically transported mobile signal(s), which prepare the uninfected parts of the plant against future infections by a broad spectrum of pathogens 1-9. Founded on the assumption that SAR is regulated by highly conserved key signal initiation processes, our work focuses on the early mechanisms underlying SAR activation. In a recent breakthrough, P. Kachroo lab showed that distal transport of the phytohormone salicylic acid (SA), which was previously considered inconsequential to SAR, is in fact essential for SAR activation^{3,10}. We further showed that SA is partitioned between the symplast and the cuticle, is primarily transported via the apoplast, and that this is regulated by the transpirational pull¹⁰. These

results were further corroborated using genetic mutants that are impaired in SA transport despite exhibiting normal cuticle characteristics (unpublished results). In a second breakthrough, we identified two phased 21 nucleotide RNA (tasi-RNA) derived from Trans-Acting Small Interfering RNA3a (TAS3a) as essential for SAR (Science Advances, in press). Based on their time frame of synthesis (3 h post pathogen infection) and systemic movement (4 h post pathogen infection), we propose that tasi-RNAs function as the elusive early mobile SAR signal. An NSF proposal related to characterizing TAS3a-based signaling was recently recommended for funding. This project will help generate the first comprehensive profile of the metabolic reconfigurations underpinning early SAR events. The knowledge gained here will be important for developing an in-depth understanding of this unique form of immunity and facilitate its use in developing sustainable and environmentally friendly crop protection strategies. This project is carried out in collaboration with Aardra Kachroo (Plant Pathology), David McLetchie (College of Arts and Sciences, CAE), Murray Grant (Warwick University, United Kingdom), and Jin Chen (College of Medicine).

Project 2: Carbon sequestration and its effect on biomass: Atmospheric carbon dioxide (CO₂) can be generated via natural processes or human activities and is one of most common greenhouse gases. Energy-related activities resulted in the generation of 5.1 billion metric tons of CO₂ in the US, which is approximately one sixth the global CO₂ emission. Carbon sequestration is the process of capturing and storing atmospheric CO₂ and is instrumental in reducing the amount of atmospheric CO₂. Carbon sequestration is also an effective way to reduce global climate change while simultaneously improving carbon flux and photosynthesis (biomass) in the plants. In collaboration with David McLetchie (CAE), we are testing chemical formulations that potentially improve carbon sequestration by plants.

Project 3: Characterization and processing of full-fat soybeans: This project involves the evaluation of quality and nutritional value of full-fat soybeans. We assay crude and digestible protein, essential amino acids, oil, sugar, free FAs, as well as FA composition of the oil. This project is carried out in collaboration with David Hildebrand (PSS) and Adedeji Akinbode (College of Engineering).

Project 4: Evaluation of high-omega-3 soybeans in soy-based diets for aquaculture: The overarching goal of this project is to improve the nutritional profile of farmed fish with the use of enhanced alpha linolenic acid (ALA) containing soy-based feed. We characterize the nutritional and anti-nutritional profiles of conventional and high-ALA soybean meal (SBM) and soybean oil (SBO), evaluate the dietary replacement of conventional SBM and SBO with high-ALA SBM and SBO on the production performance of hybrid striped bass. Muscle fatty acid profiles, liver antioxidant and lipid peroxidation status of hybrid striped bass fed with conventional or high-ALA SBM and SBO diets, are determined. The project is carried out in collaboration with David Hildebrand (Plant and Soil Sciences) and Waldemar Rossi (Kentucky State University).

Project 5: Development of Triple-Use Industrial Hemp Genotypes for Economic Production: The overall goal of this research is to develop industrial hemp, *Cannabis sativa*, genotypes as an additional crop for farmers to rotate through their fields for more environmentally and economically sustainable agronomic field crop production. Hemp can be a sustainable source of 1) valuable fiber, 2) seed oil and protein and 3) cannabinoids for health and nutraceutical uses. However, with the current state of the markets it is difficult for growers to economically produce industrial hemp for only one of these products. Development of hemp varieties to produce good yields of two or all three of these products is a sustainable and economically viable option for growers. This project, carried out in collaboration with Paul Armstrong (Kansas State University), will result in the development of: 1) New hemp varieties with low cannabinoid D9-tetrahydrocannabinol THC content (< 0.1%) suitable for outdoor seed (grain), fiber and cannabinoid production. 2) A day neutral hemp variety with low THC content and high levels of some cannabinoids of industrial interest. The seeds of selected lines will be analyzed for

oil, protein and FA composition. Beneficial traits will be confirmed in field trials. In this regard, we are also developing near Infra-red spectroscopy-based calibrations for rapid, non-destructive determination of the seed oil, protein, FA and moisture content as well as major cannabinoids including THC, CBD, CBG, CBC and CBN.

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Peter D. Nagy, Professor

Research portfolio

1. ***TBSV-yeast system to study virus replication and virus-host interactions.*** Nagy lab has developed this unique and powerful system because of the *advantages of using yeast as a model host*. This makes the awesome power of yeast genetics, biochemistry and cell biology available for virus research. Another advantage is the knowledge on host proteins is the most comprehensive in yeast. In addition, the findings from yeast model host can then be validated in the native host as we have already shown for 90 host genes for TBSV. Altogether, *the available unique combination of tools* for tombusviruses, including development of the powerful yeast replication system by the Nagy lab, and a novel cell-free authentic tombusvirus replication assay, makes yeast as a truly outstanding model to provide accelerated progress and to facilitate exploratory research on virus - host interactions, which will be applicable to RNA viruses of plants and animals.

2. Genome-wide screens and global proteomics approaches to identify host factors affecting TBSV replication.

Nagy lab has identified ~500 host genes affecting TBSV replication in yeast. This systems biology approach makes TBSV-yeast system as one of the best characterized for virus-host interactions among any pathogens.

3. Characterization of co-opted host factors critical for TBSV replication. Nagy lab has characterized the detailed functions of 90 co-opted host proteins, which are involved in various viral processes. These works revealed the complex and amazingly sophisticated interaction between TBSV and the host cells.

4. Discovery of cell-intrinsic restriction factors against TBSV replication. Nagy lab has discovered 70 cell-intrinsic restriction factors (CIRFs), which inhibit TBSV replication. Nagy lab has characterized cyclophilins, nucleolin, ribonucleases, WW-domain and TPR-domain containing proteins and co-chaperones as CIRFs. This should help opening up new antiviral approaches and our understanding antiviral responses of the host cell.

5. Identification of cellular targets of human SARS-COV2 in yeast. Nagy lab has re-cloned the 26 genes coded by SARS-COV2 (all the plasmids have been provided by Nevin Krogan, UCSF) into yeast expression plasmids. These genes included the 16 Nsp (nonstructural) and the structural and accessory genes for SARS-COV2. Nagy lab has found that separate co-expression of Nsp1, Nsp5, Nsp6, Nsp15 and Orf7b of SARS-CoV-2 significantly decreased TBSV replication, whereas co-expression of N nucleocapsid enhanced TBSV replication by over 2-fold.

Nagy's papers have been cited (referenced) in human/animal virologists' papers over 500x

Nagy's papers have been cited (referenced) in SARS-CoV-2 papers over 100x:

These references show the high impact of Nagy's papers on broader research fields, not only in plant virology.
NSF:

3 years: total of 1.14 months by Nagy (3.2% effort)

Community service:

Section editor for PLoS Pathogens (leading community journal in the field of pathogens and microbes)

Grants (last 6 years):

Nagy as PI:

1 NSF-IOS

1 NSF-MCB

1 NIH-NIAID

1 USDA-NIFA

Publications:

Total: 33; including Cell Host & Microbe, PNAS (2); And PLoS Biology; PLoS Pathogens high impact journals

Citations (since 2017: 3100)

Christopher L. Schardl, Professor and Chair

Schardl currently serves as the Department Chair, while also contributing to the research, teaching and service missions of the department. He has been Chair since July 1, 2011, and is in the fifth year of a second six-year term. From 2001 to 2011 he directed the Advanced Genetic Technologies Center, a high-throughput genomics and genetic analysis facility, which has since been transferred to UK Health. He has also served as Director of Graduate Studies. He has advised 15 PhD students (all completed), 6 MS students (5 completed, 1 current), and 24 postdoctoral scholars, and hosted visiting professors (7), visiting scholars (10), graduate student lab rotations (8), undergraduate students/ post-baccalaureates (51), high school teachers (3), and high school students (17).

The Schardl lab focuses on heritable mutualistic symbioses between plants and seed-borne fungal symbionts (endophytes). The fungi protect plants from insects, drought and other stresses. We have discovered genes for synthesis of protective alkaloids including ergot alkaloids used in numerous pharmaceuticals, the broadly anti-insect aminopyrrolizidine alkaloids (lolines), and the indolizidine swainsonine. To understand the evolution of the endophytes and their alkaloid genes, we have identified and described dozens of endophyte species and sequenced dozens of genomes and transcriptomes. We are also using this information to understand the basis for host-endophyte compatibility and vertical (seed) transmissibility that are crucial for maintaining mutualistically beneficial symbioses.

Schardl currently heads a multi-institutional U.S.-China collaboration funded by the NSF Dimensions of Biodiversity program, and involving UK, Eastern Kentucky University, New Mexico State University and the University of Miami in the U.S., and Lanzhou University, Nankai University, and the Chinese Academy of Sciences at Kunming in China. The study addresses the diversity of seed endophytes and flowering plants at phylogenetic, genetic and functional levels. Activities include a broad survey of plants for fungal endophytes and focused investigation of target plant species and plants with which they associate in natural environments. Approaches include morphometric, biochemical (alkaloid) transcriptomic and phylogenetic analyses. A strong outreach component involves middle and high schools, introducing underserved groups of students to a range of scientific approaches including ecology, biochemistry, microbiology, plant biology, genomics, and even cartography.

Current competitive funding: NSF: \$1,240,916, Jan. 1, 2021–Dec. 31, 2025.

Funding history: Schardl has had Federal competitive funding every year since 1987, including multiple grants each from USDA, NSF and NIH, in addition to numerous other funding sources.

Publications: Schardl has 121 refereed research publications, 25 peer-reviewed reviews and chapters, 47 other papers and chapters and 3 patents. He has an h-index of 68 on Google Scholar (35 since 2017) and 56 on Clarivate Web of Science.

Laboratory: Two Scientist I positions (combined Hatch and other grant funding), two graduate students (NSF funding). The laboratory regularly includes variable numbers of undergraduate interns, and occasionally a high school student.

Teaching: Schardl teaches the 1-cr. elective course, Plant Bacteriology (PPA 670) as needed, organizes the graduate student orientation course, and contributes to PPA 500 and PPA 641. In recent years Schardl has also taught the seminar course, PPA 770, instituting a training program for each student presenter who takes the course for credit.

Lisa J. Vaillancourt, Professor

The Vaillancourt lab studies genetic mechanisms of fungal pathogenicity to grain crops, focusing on stalk rots of maize, and ear rots of maize and wheat, caused by *Colletotrichum* and *Fusarium* fungi. They use a combination of experimental approaches including cytology, genetics, and genomics (including transcriptomics and proteomics). Stalk and ear rots consistently rank among the top three causes of yield loss in maize and wheat in the U.S. resulting in millions of dollars in losses annually. These diseases are difficult to manage because their severity is heavily dependent on the environment and on levels of host stress, and variation in the pathogen population means that resistance sources don't always perform similarly in different locations. The Vaillancourt lab has moved our understanding of stalk rot ahead

significantly and has demonstrated the role of secreted effectors in the establishment of disease, offering the hope of better management through engineered universal resistance mechanisms. Vaillancourt is an internationally known authority on the molecular biology of *Colletotrichum* and she led the first genome sequencing effort for that genus. She has published 60 refereed journal articles that have been cited nearly 3000 times and she has brought close to \$3,000,000 in grant funding. Her grantsmanship skills were recognized by the college with the Bobby Pass Excellence in Grantsmanship Award in 2010. Vaillancourt has also had active collaborations with several sorghum and maize seed companies. She has been particularly successful as a mentor, graduating seven Ph.D. students, four of whom now hold university faculty positions (one as a department chair). Two others work for private companies (Bayer and Ball Horticultural), and the seventh is employed as a research scientist here at UK. She has also trained seven M.S. students, four of them in collaboration with members of our extension faculty (Hartman, Gauthier, Bradley). Three of these students went on to Ph.D. degrees, one went to the USDA-ARS as a research technician, and one went to the University of Nebraska as a diagnostician. One is a research technician here at UK in the Forestry program, and the seventh just graduated last month. Vaillancourt currently has two Ph.D. students and one M.S. In addition to being a solid research performer, she has added significant value in other ways. She served as our DGS for more than ten years and in that time established our dual degree graduate program with Universidade Federal de Viçosa in Brazil (<https://plantpathology.ca.uky.edu/graduate/dual-degree>) that includes joint advising of U.S. and Brazilian students, and course exchanges in both on-line and in-person formats. The partnership with UFV provides an excellent learning environment and unique global experience for graduate and undergraduate students. Vaillancourt was given the George E. Mitchell Jr. Outstanding Faculty Award for Service to Graduate Students by Gamma Sigma Delta in 2007 for her efforts as DGS. Other service has included terms on the University Senate, the University Graduate Council, the Agriculture Faculty Senate, and numerous Provosts and Deans committees over the years. She has also served on multiple NSF and USDA grant panels, and on the editorial boards of several national and international journals. Vaillancourt founded a college-wide mentoring outreach program in collaboration with a local high school, the Carter G. Woodson Academy, that serves Black and Hispanic youth. With Drs. Kenneth Jones and Mia Farrell, she obtained grant funding to support independent research experiences for students (see pages 20-23: https://issuu.com/ukcafe/docs/2018_spring_ukcafe_magazine). More than a dozen Black and Hispanic H.S. juniors and seniors have participated so far. The students have won multiple awards for their research, including first place awards at the state science fairs in plant science. The students benefit from exposure to and participation in university-level plant science research, while department faculty, students, and staff benefit from opportunities to mentor and teach these students.

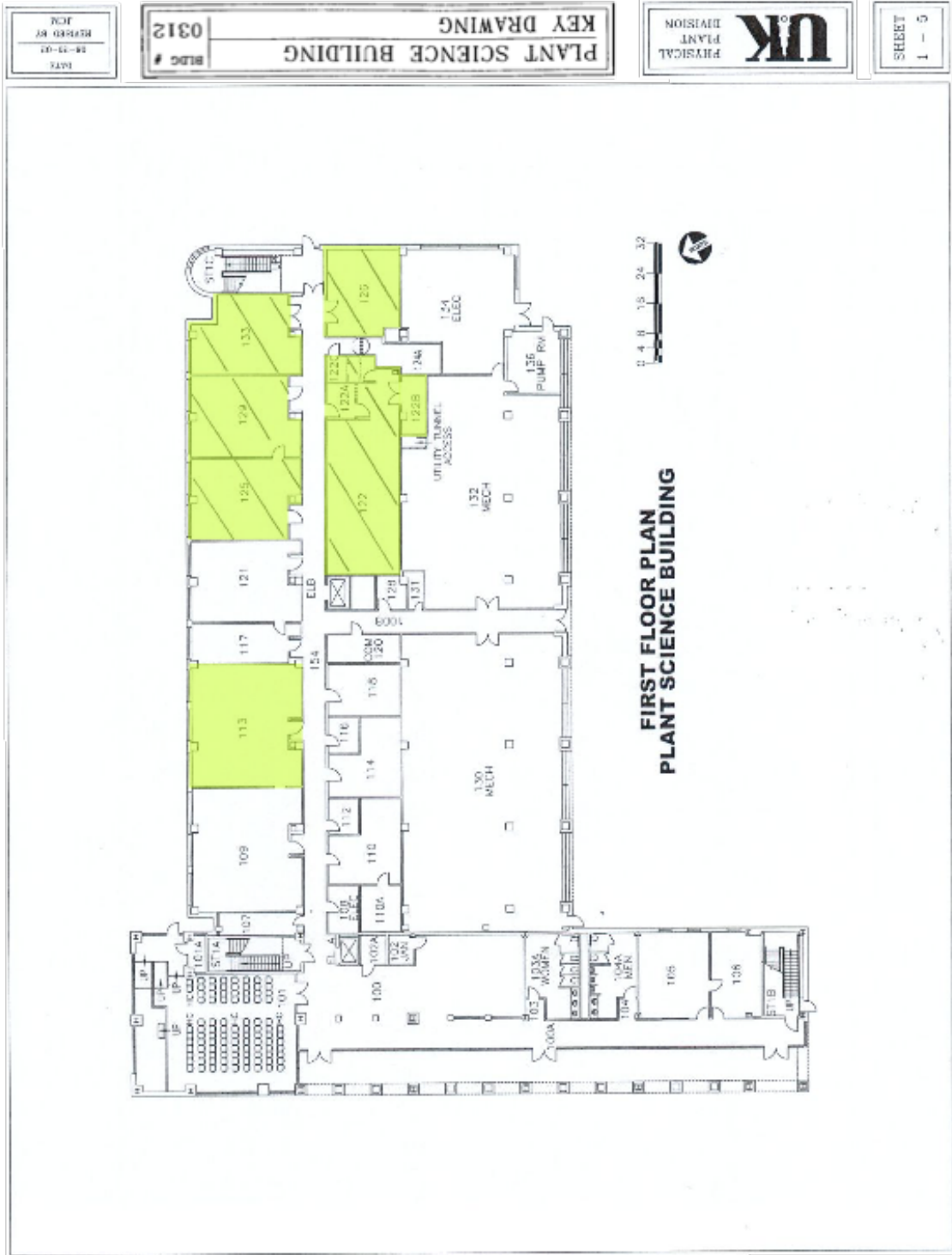
Appendix 6: Special Title Series Faculty Narrative

R. Louis Hirsch, Assistant Professor

Dr. Robert Hirsch's appointment as an STS faculty is primarily undergraduate facing and focused on Instruction (60%) with the remainder of his foci split between Administration (15%), Service (20%), and Research (5%; values approximate). Hirsch primarily or co-instructs several courses for the college in multiple programs, including ABT 101 Introduction to Biotechnology (coordinating co-instructor), ABT 120 Genetics and Society (primary instructor), PPA 300 GMOs: Facts, Myths, and their Impact on Society (primary instructor), NRE 390: Advanced Scuba Certification and Coral Reef Conservation (coordinating co-instructor), EXP 396 Credit-bearing Internship (primary instructor), PPA 400G Principles of Plant Pathology (primary instructor), PPA 500 Physiology of Plant Health and Disease (co-instructor), and PPA799 Teaching in Plant Pathology (primary instructor). Hirsch also serves as the Director of Undergraduate Studies for two programs in CAFE: Agricultural and Medical Biotechnology, and Agriculture Individualized Curriculum. His service obligations dovetails with his research focus on developing and improving standards-based K-12 and collegiate STEM curricula in the plant sciences and other related disciplines. Additionally, he serves in university, regional, and national leadership positions, including the College Council (i.e., steering committee) for the UK Lewis Honors College, the Bluegrass Community and Technical College Biotechnology Advisory Council, and the Webinar Editor for the American Phytopathological Society (to name a few).

Appendix 7: Space assigned to the Department of Plant Pathology

Light green highlights indicate space assigned to the department.

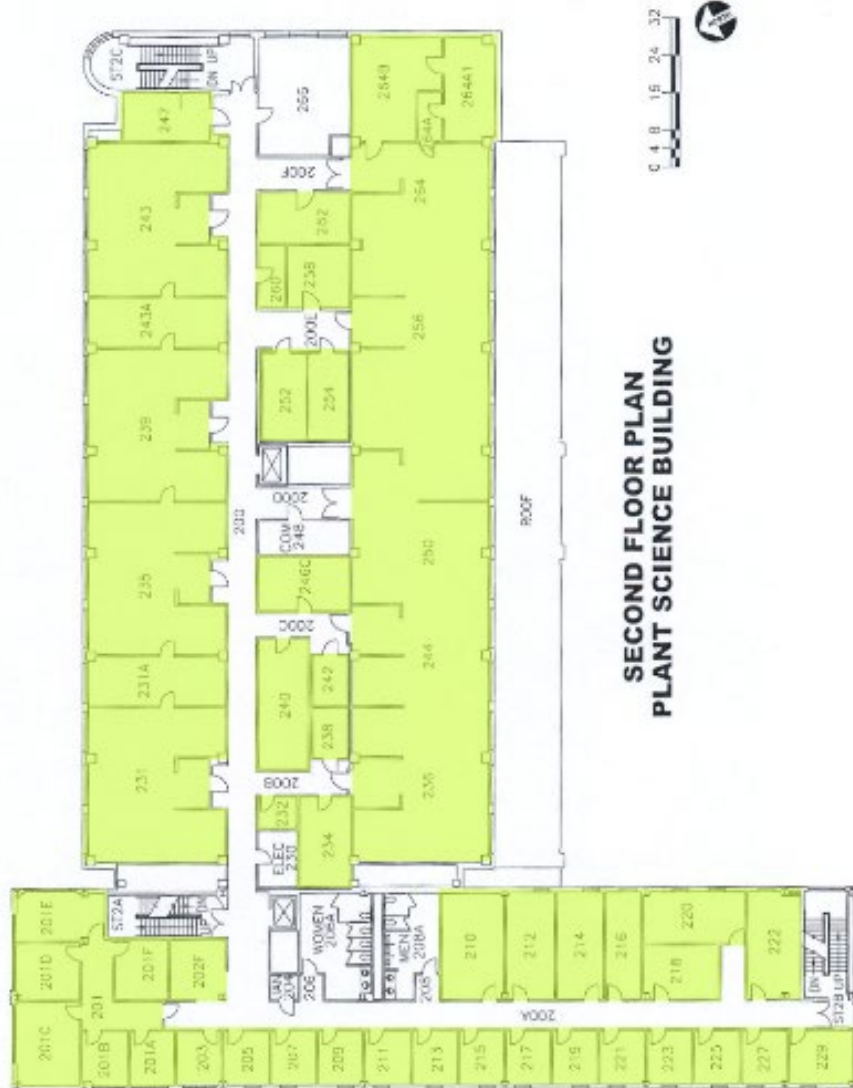


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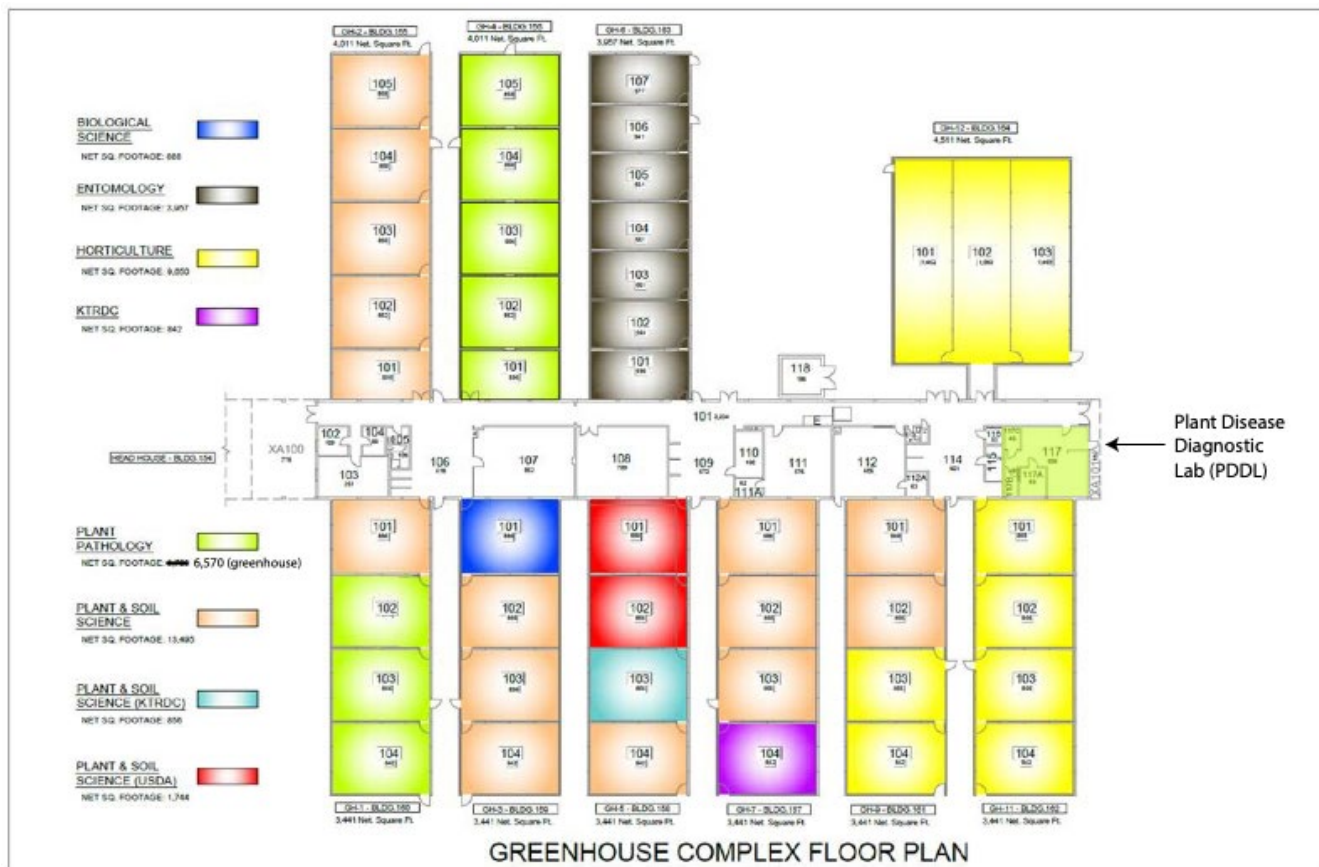
PLANT SCIENCE BUILDING
 KEY DRAWING
 BLDG # 0312

UK
 PHYSICAL
 PLANT
 DIVISION

SHEET
 2 - 2



**SECOND FLOOR PLAN
 PLANT SCIENCE BUILDING**



Appendix 8. Department state budgets in the past three years.

FY 2020		Subtotal	Total
All Functional areas			\$ 2,111,751.08
Instruction		\$ 470,139.53	
Research		\$ 1,111,997.71	
PPA N-S RESEARCH	\$ 74,240.85		
AG PP STATE FUNDS	\$ 1,037,756.86		
Public Service		\$ 529,613.84	
PPA N-S EXTENSION	\$ 74,490.85		
AG PP EXT STATE	\$ 455,122.99		
 FY 2021		 Subtotal	 Total
All Functional areas			\$ 2,070,990.58
Instruction		\$ 481,780.84	
Research		\$ 1,090,328.40	
PPA N-S RESEARCH	\$ 74,239.41		
AG PP STATE FUNDS	\$ 1,013,006.23		
Public Service		\$ 498,881.34	
PPA N-S EXTENSION	\$ 76,435.08		
AG PP EXT STATE	\$ 442,446.26		
 FY 2022		 Subtotal	 Total
All Functional areas			\$ 1,698,860.01
Instruction		\$ 316,829.58	
Research		\$ 911,973.01	
PPA N-S RESEARCH	\$ 55,677.78		
AG PP STATE FUNDS	\$ 856,295.23		
Public Service		\$ 470,057.42	
PPA N-S EXTENSION	\$ 55,677.78		
AG PP EXT STATE	\$ 414,379.64		

Date: March 27, 2022	
Day 1: Sunday	
12:00 – 5:00 pm	Reviewers external to UK or from off-campus facilities travel to Lexington Dr. Lawrence Datnoff arrives at Bluegrass Airport at 1:55 pm Designated local committee member transports Dr. Datnoff to Campbell House Inn
6:15 pm	Designated local committee member transports Dr. Datnoff from Campbell House Inn to Frank & Dino's Restaurant.
6:30 – 8:00 pm	Review Committee has dinner and working session at Frank & Dino's Restaurant at 271 W Short St, Lexington, KY 40507. Valet parking available at restaurant if desired. Group is joined by Department Chair Dr. Chris Schardl. A local committee member returns Dr. Datnoff to Campbell House Inn.

Date: March 28, 2022	
Day 2: Monday	
7:30 – 8:30 am	Breakfast on own (hotel guests dine at Campbell House Inn)
8:30 – 8:45 am	Local committee member transports Dr. Datnoff to E.S. Good Barn
9:00 – 9:45 am	Meet with College of Agriculture, Food and Environment Dean Nancy Cox and Associate Dean for Faculty Resources, Planning and Assessment Brian Lee. Committee receives their charge from Dean Cox and Dr. Lee reviews rules and procedures. ES Good Barn, Weldon Suite
9:45 – 10:45 am	Meet with departmental teaching and research faculty, ES Good Barn, Weldon Suite
10:45 – 11:00 am	Break
11:00am – 12:00pm	Lunch with departmental graduate students, ES Good Barn, Weldon Suite, departmental faculty/staff committee members recused.
	Dr. Nicole Donofrio arrives at Bluegrass Airport at 12:30 pm and transportation to ES Good Barn is provided by designated college representative.
12:00 – 1:00 pm	Lunch continuation with departmental post-docs and visiting scientists, ES Good Barn, Weldon Suite
1:00 – 1:30 pm	Break and walk to department location TBD

1:30 – 3:00 pm	Meet department chair Dr. Chris Schardl, for departmental facility tour and discussion: 266 Plant Science Building, Greenhouse Complex, Plant Disease Diagnostic Laboratory (PDDL)
3:00 – 3:45 pm	Break and travel to South Farm. Committee transportation provided by van.
3:45 – 4:30 pm	Tour of field research operations at South Farm led by Mr. Dixon
4:30 – 5:00 pm	Break and travel to Saul Good Restaurant at 3801 Mall Rd #120, Lexington, KY 40503
5:00 – 7:00 pm	Working dinner at location Saul Good for all committee members
7:00 – 8:00 pm	Travel to E.S. Good Barn by van and local committee member transports hotel guests to Campbell House Inn

Date:	March 29, 2022
Day 3:	Tuesday

7:45 – 8:00 pm	Local committee member transports hotel guests to ES Good Barn
8:00 – 9:00 am	Working breakfast with review committee, ES Good Barn, Weldon Suite
9:00 – 9:45 am	Meet with departmental support staff, ES Good Barn, Weldon Suite, departmental faculty committee member recused.
9:45 – 10:15 am	Meet with departmental technical staff scientists, ES Good Barn, Weldon Suite, departmental faculty committee member recused.
10:15 – 11:00 am	Meet with Plant Disease Diagnostic Lab staff, ES Good Barn, Weldon Suite, departmental faculty committee member recused.
11:00am – 12:00pm	Break
12:00 – 1:30 pm	Lunch with external stakeholders and industry partners, ES Good Barn, Weldon Suite
1:30 – 2:30 pm	Meet with departmental Extension faculty, ES Good Barn, Weldon Suite
2:30 – 5:00 pm	Break (designated local committee member transports hotel guests to Campbell House Inn)
5:00 – 7:00 pm	Working dinner at Campbell House Inn for all committee members

Date:	March 30, 2022
Day 3:	Wednesday

7:00 – 10:45 am	Breakfast on own and free morning for committee (hotel guests dine at Campbell House Inn)
10:45 – 11:00 am	Local committee member transports hotel guests to ES Good Barn

11:00am – 12:00pm	Video conference with Extension agents, ES Good Barn, Weldon Suite, departmental faculty committee member recused.
12:00 – 1:00 pm	Committee lunch and working session, ES Good Barn, Weldon Suite
1:00 – 3:00 pm	Move to ES Good Barn Culton Suite and committee working session/breaks as determined based on committee need
3:00 – 4:00 pm	Meet with college leadership in ES Good Barn, Culton Suite Dr. James Matthews, Research Dr. Carmen Agouridis, Instruction Dr. Laura Stephenson, Extension Dr. Orlando Chambers, Administration (facilities) Dr. Brian Lee, Faculty Resources, Planning and Assessment Dr. Mia Farrell, Diversity, Equity, and Inclusion Mr. Brent McCauley, Philanthropy and Alumni Note- additional college administrators may be invited to attend if available at the committee's discretion.
4:00 – 5:00 pm	Break and travel to Merrick Inn Restaurant at 1074 Merrick Dr, Lexington, KY 40502 (designated local committee member transports hotel guests)
5:00 – 7:00 pm	Working dinner at Merrick Inn for all committee members
7:00 – 7:30 pm	Designated local committee member transports hotel guests to Campbell House Inn

Date:	March 31, 2022
Day 4:	Thursday

7:45 – 8:00 am	Local committee member transports hotel guests to ES Good Barn
8:00am – 12:30pm	Committee working session (breakfast and lunch will be delivered), ES Good Barn, Weldon Suite. During this time, committee will reflect on the self-study document and listening sessions while developing a list of recommendations for college and department consideration. The committee is free to take breaks as needed and split into smaller groups for focused work if desired.
12:30 – 2:00 pm	Committee finalizes draft recommendations, ES Good Barn, Weldon Suite
2:00 – 3:00 pm	Committee presents preliminary findings to college leadership, ES Good Barn, Weldon Suite
3:00 – 4:00 pm	Designated local committee member transports hotel guests to Campbell House Inn or Bluegrass Airport Flight schedules: Dr. Datnoff departs Bluegrass Airport at 5:32 pm Dr. Donofrio departs Bluegrass Airport at 12:51 pm April 1

Review Committee

Dr. Richard Coffey	Committee Chair and Chair of UK Animal and Food Sciences
Dr. Lawrence Datnoff	Louisiana State University, Plant Pathology and Crop Physiology Department Head
Dr. Nicole Donofrio	University of Delaware Department of Plant and Soil Sciences Faculty
Dr. Steven Van Lanen	UK Department of Pharmaceutical Sciences Faculty
Laura Knoth	Kentucky Corn Growers Association Executive Director
Amanda Sears	Kentucky Cooperative Extension Service, Madison County Office
Dr. Kiersten Wise	UK Plant Pathology Faculty
Edward Dixon	UK Plant Pathology Research Analyst Staff
April Lamb	UK Plant Pathology Graduate Student

Support for Review Committee

Dr. Brian Lee
Tricia Coakley

Office Phone #
859-257-7249
859-257-7041 (forwarding to cell when away from office)



Department of Plant Pathology
 College of Agriculture, Food and Environment
 University of Kentucky

2022 Periodic Program Review

Review Committee site visit March 27–31, 2022

Review Committee Report Submitted on April 15, 2022 by:

Dr. Richard Coffey	Committee Chair and Department Chair of UK Animal and Food Sciences
Dr. Lawrence Datnoff	Louisiana State University, Plant Pathology and Crop Physiology Department Head
Dr. Nicole Donofrio	University of Delaware Department of Plant and Soil Sciences Faculty
Dr. Steven Van Lanen	UK Department of Pharmaceutical Sciences Faculty
Laura Knoth	Kentucky Corn Growers Association Executive Director
Amanda Sears	Kentucky Cooperative Extension Service, Madison County Office
Dr. Kiersten Wise	UK Plant Pathology Faculty
Edward Dixon	UK Plant Pathology Research Analyst Staff
April Lamb	UK Plant Pathology Graduate Student

Executive Summary

From a review of the departmental Self-study Report and listening sessions with department personnel (faculty, staff, students), County Extension Agents, stakeholders, and college administration, the Review Committee assessed the department’s programs, services, resources, processes, and operations, with an overall objective of providing constructive feedback highlighting strengths, challenges, and opportunities, culminating with a list of specific recommendations for enhancement.

There was a high degree of thematic consistency among those involved in the listening sessions. While there are several challenges facing the department, there are strategies that can be used to address the

challenges. Additionally, the Review Committee believes that most of the department's faculty, staff, and students are highly motivated to address the challenges for the betterment of the department.

Opportunities exist for the department to build on their long history as a recognized leader in fundamental plant pathology research to address ongoing and emerging plant disease challenges, to continue providing important graduate student training and mentoring, and to continue providing important outreach programs that are desired and supported by County Extension Agents, stakeholders, and clientele. Further, the department is well positioned to continue serving both rural and urban clientele in the Commonwealth through the diagnostic services of the [two] Plant Disease Diagnostic Laboratories, as well as to continue its strong legacy of support for the college's multidisciplinary Agricultural and Medical Biotechnology undergraduate degree program.

Brief Description of External Review Committee Process

- Prior to the review, all committee members received and studied the departmental Self-study Report submitted by faculty of the Department of Plant Pathology.
- The committee received their charge from Dean Nancy Cox, and Dr. Lee, Associate Dean for Faculty Resources, Planning and Assessment, conducted listening sessions with departmental faculty, staff, students, extension agents, and industry stakeholders from March 28–31, 2022.
- On Thursday, March 31, the committee held working sessions and drafted talking points about the program's strengths, challenges, opportunities, and potential committee recommendations.
- Immediately following the working sessions, the committee presented draft recommendations to CAFE leadership.
- The Committee Chair, Dr. Richard Coffey, worked with the committee to prepare this report, which all members of the committee have approved.

The following report is organized into four main sections (instruction, research, extension, and administration). Within each of these sections is presented a brief list of strengths, challenges, and opportunities. The report concludes with recommendations for the Department of Plant Pathology to consider and act on over the upcoming six-year program review cycle as specified by university regulations.

Instruction

Strengths

- Creation of a Special Title Series faculty position for the recent hiring of Dr. Lou Hirsch, who tackles a substantial portion of undergraduate teaching, and who advises several hundred students in the Agricultural and Medical Biotechnology Program, which appears to be a very popular and well-received program in the college and across campus. This shows a commitment to undergraduate instruction in a department that does not have an undergraduate major.
- Mentorship of high school and undergraduate students led by graduate students in some labs.
- Dr. Vaillancourt's collaboration with the CAFE Office of Diversity in outreach to underrepresented high school students that has led to increased enrollment in the Agricultural and Medical Biotechnology Program.
- Dual doctoral degree program with Universidade Federal de Vicosa in Brazil.
- Willingness and desire of extension faculty to include graduate students in field visits and other experiences with growers.

- Involvement of extension faculty in teaching undergraduate and graduate courses.
- Exemplary technical staff who train graduate students and undergraduate Agricultural and Medical Biotechnology students in laboratory and field work.
- Excellent efforts towards making courses virtually accessible to graduate students at the Research and Education Center at Princeton.

Challenges

- Current undergraduate teaching and Agricultural and Medical Biotechnology advising falls heavily on the Special Title Series faculty member and is not sustainable in the long term.
- Better transparency and communication regarding the teaching budget is needed from departmental leadership.
- Significant gaps exist in the graduate student curriculum including important areas of bacteriology, nematology, and epidemiology. Additionally, some courses currently listed are not being taught due to faculty losses.
- Level of undergraduate and graduate student teaching by extension faculty may limit time for their outreach and research activities.
- Time to degree completion is excessive in many cases for both MS and PhD students.
- Required courses are not offered frequently enough for both MS and PhD students to complete their degree requirements. Additionally, required courses are often canceled, putting the graduate students behind in degree completion.
- There are frequently not enough students enrolled to make the required minimum to teach a graduate level course. This has led to the required course often being waived.
- In many cases, graduate students voiced feeling unprepared to enter the workforce following degree completion.
- The graduate curriculum lacks cohesion and agreement around a core set of required courses.
- Creation and promotion of professional development opportunities for graduate students is not consistent across all laboratories and is lacking in some.

Opportunities

- Promoting and recognizing faculty, staff, and students through college, university, and professional society award nominations.
- New faculty hires and/or faculty effort reallocation to focus on undergraduate and graduate teaching.
- Addition of at least two dedicated Teaching Assistants to help shoulder the teaching load for the Agriculture and Medical Biotechnology Program and develop programs that will attract more undergraduates.
- Increased awareness of the value of applied research by all faculty to aid in graduate students being exposed to the broad range of research activities in the department.
- Exploration of opportunities to expand and better utilize the 4+1 program.
- Continue identifying opportunities to recruit underrepresented students to increase the diversity of the undergraduate and graduate student populations.

Research

Strengths

- World-renowned research programs in mycology, virology, and plant immunity.
- Very good record of publishing research results in high impact scientific journals.

- The research programs have competitive and consistent funding from national agencies, industry, and commodity organizations.
- Good support and encouragement by some labs for graduate students to participate in professional society meetings.
- Overall, the department currently has good infrastructure (labs, equipment, etc.) to support its research mission.
- Good research collaborations with many other college departments, as well as with the Universidade Federal de Vicosa in Brazil.

Challenges

- Development of research programs in other important areas of plant pathology, such as bacteriology and nematology.
- Current virology program is well known, but opportunities exist to make this program more focused in plant pathology.
- Better transparency and communication regarding the Agricultural Experiment Station budget from department leadership.

Opportunities

- Promoting faculty, staff, and students through college, university, and professional society award nominations.
- Scope of the department could be enhanced with the hiring of faculty with expertise in bacteriology, nematology, and epidemiology.
- Development of collaborations and partnerships with departments and colleges outside of CAFE.
- As infrastructure ages, a plan for maintenance and upgrading should be developed and implemented.

Extension/Outreach

Strengths

- Excellent support for and appreciation of extension specialists from stakeholders and county extension agents, especially for updated information on plant disease identification and management.
- Great support from stakeholders for the research conducted by specialists.
- Good adoption of a broad range of learning technologies (i.e., virtual, face-to-face, etc.) by specialists to train and educate agents and clientele.
- Responsiveness of specialists to the needs of agents and clientele.
- Development of impactful programs that are well received and adopted by clientele.
- The Plant Disease Diagnostic Lab(s) is run by two exceptional, professional diagnosticians.
- Plant Disease Diagnostic Lab(s) staff are well supported in professional development.

Challenges

- There are currently not enough faculty to cover the important commodity of ornamentals. As a stop gap measure, current faculty effort could be realigned to fill this important gap/need. However, long term this would be best served with a faculty hire that possesses expertise in ornamentals.
- Stakeholders indicated a need for tobacco pathology research and extension efforts.

- The on-campus Plant Disease Diagnostic Lab has inadequate space to effectively carry out their duties. The dirty and clean labs are side-by-side, and the current layout does not support expansion to accommodate influxes of samples.
- Adequate funding and staffing for the two Plant Disease Diagnostic Labs. However, Extension agents voiced concerns about charging a fee for diagnostic services.
- Continuing the high level of programming and county level support by specialists at Princeton while the facilities and supporting infrastructure are being rebuilt.
- Insufficient departmental funding for in-state extension-related travel.
- Loss of Motor Pool and the challenges that has created for specialists' travel.
- Better transparency and communication regarding the extension budget from department leadership.
- Communication and morale among specialists have declined over time.

Opportunities

- Promoting faculty, staff, and students through college, university, and professional society award nominations.
- Clear college administrative guidance on developing strategies to make the two Plant Disease Diagnostic Labs financially sustainable.
- Potential development of a cost structure for diagnostic services could be developed and implemented to help defray laboratory and other expenses.
- Re-building Princeton, with the inclusion of a Plant Disease Diagnostic Lab, to serve the growers and stakeholders in western Kentucky.
- Hiring and/or reevaluating faculty and/or staff efforts to meet the needs in ornamentals and tobacco.
- Increased visibility at extension and stakeholder events by department leadership.
- Organize an annual retreat for extension specialists to improve communication and collegiality.

Administration

Strengths

- Promotion and Tenure Review processes that fairly evaluates extension effort.
- Business Office staff work well to support graduate students.
- Business Office staff do a good job of professional development and developing relationships with other department Business Offices to learn processes and skills that help them be successful in their job responsibilities.
- Adequate cross-training amongst Business Office staff so all areas of responsibility can be covered when individuals are away.
- Chair has worked to protect staff positions and advocated for faculty to have adequate staff to support their research and extension needs.

Challenges

- Communication and effective leadership between all levels of current department leadership and department personnel is not enough – insufficient transparency and communication regarding budgets and budget allocations, and how infrastructure as well as resource allocation decisions are made.

- Strong and effective leadership in addressing and resolving conflict, particularly in the area of negative and inappropriate behavior toward students by certain faculty that negatively affects the students' well-being and mental health.
- Addressing the department mindset and tolerance that students are cheap and exploitable labor.
- Clear and regular communication by Director of Graduate Studies regarding policies, procedures, and required paperwork for following the degree requirements for MS and PhD students.
- Developing community and collegiality amongst all faculty, staff, and students in the department.
- Continuing to fund the 25% staff salaries/benefits that was cut from recurring state funds to meet the mandatory budget cut.
- Frequent changes in university policies and guidelines create challenges for the efficient and effective processing of paperwork for new and existing personnel, especially international post-doctoral scholars and visiting scientists.
- Inefficient use of laboratory space due to not disposing of old, non-functional research equipment.

Opportunities

- Implement a variety of community building events and activities for the department to help develop a stronger sense of trust and belonging amongst the faculty, staff, and students. Consider a departmental retreat to help drive the department environment in a positive and trustful direction.
- Add to the Graduate Student Handbook a clear process for students to communicate grievances both within the department and at the college and university levels.
- Create a culture where graduate students feel free to share concerns and grievances without fear of retribution or being stigmatized.
- Enhance Diversity, Equity, and Inclusion activities in the department (need to immediately name a DEI representative to replace the current vacancy).
- Develop a committee with representation from faculty, staff, and graduate students to evaluate the effective and efficient use of current laboratory and greenhouse space and make recommendations for departmental consideration.
- Promote the graduate student association by providing professional development opportunities such as collaborations with other laboratories both within the university and externally.

Committee Recommendations

1. The committee has identified several issues of concern related to the treatment of graduate students that must be addressed immediately by college administration through initiating a comprehensive independent investigation. These issues include a history of graduate students being required to work well beyond the amount of time allowed by university policies (including Administrative Regulations) delaying their time to degree completion, and a pattern of showing active favoritism towards certain students. Additionally, a continued pattern of abuse of power between certain faculty (whose names have been shared with college administration) and their graduate students has been allowed to persist in the department, creating an unhealthy and insecure environment for all students, as well as staff and other faculty. In addition to the independent investigation, we recommend a formal process of departmental oversight be

developed to prevent these issues from occurring in the future, which could include involvement offices at the college and university levels.

2. Develop methods to communicate the resources and support available through the university for health and mental well-being of students, staff, and faculty, as well as how to report issues of grievance and Title IX issues.
 - a. Develop a departmental web page that identifies and provides linkages to these important resources, including a link to the university's Basic Needs web site (<https://www.uky.edu/basicneeds/home>).
 - b. The department chair will work with college administration and the CAFE Office of Diversity to provide training to better equip faculty, staff, and students on DEI issues, cultural sensitivity issues, team and community building, as well as building a climate of trust.
 - c. Develop a Graduate Student Handbook section that clearly articulates and communicates to students the formal processes of sharing issues of concern, grievances, and/or cases of harassment.
3. Identify and appoint a tenured departmental faculty member to serve on the CAFE Diversity, Equity, and Inclusion Department Representatives Committee who will work with the department chair on recommendation 2.
4. Develop a specific plan to add new faculty to the department to address significant gaps in expertise in the context of the college and university faculty hiring process. Specific positions to add could include:
 - a. Extension Title Series Specialist position with training in advanced molecular diagnostics and ornamentals.
 - b. Regular Title Series Modeling/Epidemiologist position specializing in emerging infectious diseases especially viruses.
 - c. Regular Title Series Phytobiome/Microbiome position specializing in bacterial plant associations and environmental sampling.
5. Add personnel and/or redirect effort in existing Regular Title Series lines to help manage and bolster the undergraduate teaching responsibilities, and to help take advantage of future opportunities. This solution may include a new Lecturer position and/or TA lines.
6. The current graduate curriculum needs to be reexamined closely and retooled to provide well-rounded training that includes, in addition to mycology, virology, and plant immunology, the other important areas of bacteriology, nematology, and epidemiology that can be taught on a consistent, regularly scheduled basis to ensure comprehensive and timely degree completion for students.
7. Develop a department level Awards and Recognition Committee.
 - a. Nominate department faculty, staff, and students for department, college, university, and professional society awards to recognize excellence within the department and bring recognition for efforts.
 - b. Develop department-level awards that recognize students and staff. Examples could include Outstanding MS Student, Outstanding PhD Student, Outstanding Staff, etc.

8. Work with college administration to develop a funding plan that supports necessary infrastructure and allows adequate staffing that will make the two PDDLs financially sustainable and service oriented.
9. Work with college administration to immediately develop a succession plan for new leadership in the Chair and Director of Graduate Studies positions. Individuals for these positions should possess strong leadership and communication skills, as well as skills in conflict resolution.

UK Program Review Implementation Plan

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

College/Unit: Plant Pathology Department

Date: 9/12/2022

Recommendation/ Suggestion	Source I/E/H*	Accept/ Reject**	Unit Response (resulting goal or objective)	Actions (including needed resources)	Time Line
<p>1. The committee has identified several issues of concern related to the treatment of graduate students that must be addressed immediately by college administration through initiating a comprehensive independent investigation. These issues include a history of graduate students being required to work well beyond the amount of time allowed by university policies (including Administrative Regulations) delaying their time to degree completion, and a pattern of showing active favoritism towards certain students. Additionally, a continued pattern of abuse of power between certain faculty (whose names have been shared with college administration) and their graduate students has been allowed to persist in the department, creating an unhealthy and insecure environment for all students, as well as staff and other faculty. In addition to the independent investigation, we recommend a formal process of departmental oversight be developed to</p>	E	Reject	Addressed by internal Recommendation #10, below.		

<p>prevent these issues from occurring in the future, which could include involvement offices at the college and university levels.</p>					
<p>2. Develop methods to communicate the resources and support available through the university for health and mental well-being of students, staff, and faculty, as well as how to report issues of grievance and Title IX issues.</p> <ul style="list-style-type: none"> a. Develop a departmental web page that identifies and provides linkages to these important resources, including a link to the university's Basic Needs web site (https://www.uky.edu/basicneeds/home). b. The department chair will work with college administration and the CAFE Office of Diversity to provide training to better equip faculty, staff, and students on DEI issues, cultural sensitivity issues, team and community building, as well as building a climate of trust. c. Develop a Graduate Student Handbook section that clearly articulates and communicates to students the formal processes of sharing issues of concern, grievances, and/or cases of harassment. 	<p>E</p>	<p>Accept</p>	<p>We note that links to these and many other resources are on the University of Kentucky Graduate School web site, and that the Graduate School provides an orientation for incoming students. The University of Kentucky 'Basic Needs' web site will be linked to the department web site, and the link will also be published in the department's Graduate Student Handbook.</p> <p>The Department has a 1-cr. orientation course that all incoming graduate students are expected to take. The published resources will be presented in that course.</p> <p>The Chair will coordinate with the Office of Diversity to arrange for a session each Fall through the aforementioned orientation course.</p> <p>The current Graduate Student Handbook outlines procedures for students to communicate such matters. The handbook will be expanded on the topic with appropriate web links.</p>	<p>No additional resources required.</p>	<p>Years 1-2</p>

3. Identify and appoint a tenured departmental faculty member to serve on the CAFE Diversity, Equity, and Inclusion Department Representatives Committee who will work with the department chair on recommendation 2.	E	Accept	Following the untimely death of the Department's previous representative to the DEI committee, The Department has not yet identified a replacement. This situation is now being addressed.	The department will identify and appoint a faculty member to serve on the CAFE DE&I Department Representatives Committee. No additional resources required.	Year 1
4. Develop a specific plan to add new faculty to the department to address significant gaps in expertise in the context of the college and university faculty hiring process. Specific positions to add could include: a. Extension Title Series Specialist position with training in advanced molecular diagnostics and ornamentals. b. Regular Title Series Modeling/Epidemiologist position specializing in emerging infectious diseases especially viruses. c. Regular Title Series Phytobiome/Microbiome position specializing in bacterial plant associations and environmental sampling.	E	Accept	For each requested position a proposal will be developed with departmental faculty input and consideration will be given to impact on each Land Grant mission area: Enhanced responsiveness to stakeholders, enhancement of the teaching curriculum, and expected increases in external funding for Research. Position proposals will clarify how each position will enhance outcomes for the department individually and in collaboration with other existing and anticipated departmental positions—and identify potential impact among collaborations outside the department or college.	Proposals will be developed and submitted for college feedback. Funds are required for new faculty lines in the department, along with appropriate startup packages.	Years 1-6
5. Add personnel and/or redirect effort in existing Regular Title Series lines to help manage and bolster the undergraduate teaching responsibilities, and to	E	Accept	If successful in adding faculty lines, the department will seek to increase involvement in undergraduate instruction, and will request from the university resources for that endeavor.	Action on this item is dependent upon success regarding actions planned for recommendation #4.	Years 1-6

<p>help take advantage of future opportunities. This solution may include a new Lecturer position and/or TA lines.</p>					
<p>6. The current graduate curriculum needs to be reexamined closely and retooled to provide well-rounded training that includes, in addition to mycology, virology, and plant immunology, the other important areas of bacteriology, nematology, and epidemiology that can be taught on a consistent, regularly scheduled basis to ensure comprehensive and timely degree completion for students.</p>	E	Accept	<p>The committee did not see course syllabi. The topics mentioned in this recommendation are either embedded in existing courses or provided by elective courses. Nevertheless, the department is invested in student success and considers regular curriculum review an important recommendation.</p> <p>The Department has regularly discussed its curricula for the M.S. and Ph.D. degrees, including a major overhaul in 2005. However, we have identified sources of difficulty, such as lack of timely communication, that resulted in students being unable to take some of the courses they desired and anticipated to take. The Department and the Director of Graduate Studies have made progress addressing this issue, but regular refinements are likely to result in a more optimal situation for current and future students.</p>	<p>The Academic Program Committee will conduct a formal curriculum review every two years to address matters such as utility for future career options, appropriateness for the discipline, and opportunities for joint courses with other institutions. Furthermore, the DGS will maintain and publish regularly and in timely fashion the expected years and semesters of instruction for PPA graduate courses, as well as available courses in other institutions such as those taught by our dual-degree partner (Federal University of Viçosa, Brazil).</p>	Years 1-3
<p>7. Develop a department level Awards and Recognition Committee.</p> <p>a. Nominate department faculty, staff, and students for department, college, university, and professional society awards to recognize excellence within the department and bring recognition for efforts.</p> <p>b. Develop department-level awards that recognize students and staff. Examples could include Outstanding</p>	E	Accept	<p>We are in general agreement with this recommendation. However, whether the specific examples in part b are the most appropriate for our program, or other means of recognition are more appropriate, should be left to such a committee and to the Department as a whole.</p>	<p>The department will form a Departmental Awards Committee and alignment of some Distributions of Effort will be needed to account for this activity.</p>	Years 1-2

MS Student, Outstanding PhD Student, Outstanding Staff, etc.					
8. Work with college administration to develop a funding plan that supports necessary infrastructure and allows adequate staffing that will make the two PDDLs financially sustainable and service oriented.	E	Accept	The 2021 budget cut of 9.5 % came at a time that the Department had no vacancies and no excess recurring funds. Consequently, all College support for staff salaries was reduced to cover only 30 hours per week. Any actual reduction of that nature would greatly compromise the function of the department. It is problematic to find sufficient grant funds to cover such a gap for staff, including PDDL staff. Charging fees for diagnostics is being explored, but any realistic fee system will be a minor contributor to the solution. It is our assessment, therefore, that this recommendation can be fully met only by additional funds to the Department budget for the purpose.	The department will work with college leadership to identify additional funds, largely via the college and potentially with fees for service, for support of the PDDL staff and space, both in Lexington and Princeton.	Years 1-3
9. Work with college administration to immediately develop a succession plan for new leadership in the Chair and Director of Graduate Studies positions. Individuals for these positions should possess strong leadership and communication skills, as well as skills in conflict resolution.	E	Accept	Faculty will revisit the possibilities of internal versus external search for Department Chair. Faculty will continue to nominate a candidate for the Director of Graduate Studies in keeping with the Department Rules of Procedure.	Funding for a competitive salary for the new Chair must be identified. If an external search for Chair is undertaken, startup funds may also be required.	Year 2
10. A University-level investigation to cover current practices of graduate student supervision, advising and instruction throughout the Department of Plant Pathology, with the goal of providing actionable feedback to the Department.	I	Accept	The Department takes very seriously its responsibility to help assure the wellbeing and success of all its members. A University-level investigation should address overall student experiences, PPA graduate program practices, policies and outcomes, how they may be adjusted to enhance student wellbeing, career prospects, and times to degree, while adhering to expectations of quality for their fields.	Administrative review of departmental supervision of graduate students and staff.	Years 1-2

* 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:  Digitally signed by Christopher Schardl
Date: 2022.09.12 16:00:32 -04'00'

Unit Head Supervisor Signature: 

Date: 9/12/2022