The College of Agriculture and Life Sciences offers degree programs in a unique combination of disciplines incorporating the basic life sciences and applied agricultural sciences. The college offers 9 associate, 40 baccalaureate and 31 graduate degree programs to 5,323 students. In addition, the College serves the university community by offering general education science courses in biology, zoology, entomology, botany, biochemistry, microbiology, plant pathology, toxicology, genetics, food science, nutrition, poultry science, soil science, animal science, and crop science. With an emphasis on teaching about and with the latest technology, the Educational Technology Fund (ETF) is essential to the successful delivery of laboratory intensive courses. ETF dollars are crucial for meeting student Information Technology needs. CALS also provides ETF support for shared facilities in CHASS (Sociology & Anthropology) and PAMS (Chemistry/Biochemistry and Statistics). The College’s 2007 – 2008 ETF allocation was $1,491,000 (including $354,144.00 for Biotechnology). The College received an additional one-time allocation of $156,300 to support access and enhancement of biological sciences, expand scientific teaching laboratory activities in Biochemistry, Genetics, Crop Science and Food Science departments as well as throughout the College. $54,000 one-time funds were used to purchase equipment to implement technology initiatives throughout the College. CALS also used $17,306 one-time monies from DUAP to purchase and additional printer in order to support NCSU Undergraduate Programs. CALS coordinated and printed 1,641 research symposium posters.

1. Categorized ETF Expenditure Summary

Expenditures reported in the narrative represent the College of Agriculture and Life Sciences’ departmental expenditures and do not include the Biotechnology ETF expenditures. An itemized list of expenditures by account code including the Biotechnology funds managed through CALS follows in Section 3 of this report.

a. Personnel expenditures represented 19% of the CALS ETF allocation. ($253,421.81).
   • $107,891.04 plus benefits was expended for professional support staff. At the College level a computer consultant position and computer instructional technologist were dedicated to providing better computing services to students.
   • $114,767.04 plus benefits was spent for student-workers/staff. These individuals include computer lab proctors and “wet” laboratory student assistants.
   • $462 for contractual services such as class speaker fees, service contractors, repair personnel.

b. IT infrastructure, equipment and services (computing labs, networking, etc.)
   • $274,221.06 or 20% was expended for IT infrastructure, equipment and services. This included replacing 25 College-wide laboratory computers and purchasing computers integrated into 15 departmental initiatives. Additional IT equipment included scanners, DVD burners/player, Smart Board, video camera replacement and other digital equipment permitting students to integrate technology into their projects. CAAT replaced one poster size printer providing services for students printing 1641 quality posters.

c. Non-IT infrastructure, equipment (experimental labs, wet labs, etc.)
   • $680,783.06 or 50% of the allocation was spent for non-IT or laboratory equipment. Life Sciences invested in equipment teaching the latest technology. In addition, one-time funds enhanced laboratory experiences in Genetics and Biochemistry. Food Science, Bioprocessing and Nutrition Sciences began equipping a new laboratory with fermentation equipment to control bioreactors and Biology purchased equipment for the new Human Anatomy and Physiology courses. By adding seats in Biology 105 and Biology 181 for new freshmen, Additional equipment was needed for lecture/labs. Crop Science used one-time funds to purchase a new compound microscope with digital imaging capabilities.

d. Facilities (repairs and renovations, furniture, etc.)
   • $61659 or 4% was expended for repairs and maintenance of equipment. Microscopes and other laboratory equipment must be serviced in order to function properly in the laboratories. This cost ranges from $200 to $6,000 per scope.
e. Discipline/instructional related field trips, professional development/experiences, travel, conferences, services etc.
   - $57,177 or 4% was expended for travel. Funds support field trips to business and industry but primarily are used for transportation to off campus field facilities for hands-on laboratory experiences in biology, horticulture, zoology, entomology, and animal science. Students must travel to these sites in order to conduct laboratory work and view plant and animal specimens in their natural habitats. The students also learn the appropriate management techniques and implement the latest technological practices at the animal research facilities.

f. Other/miscellaneous
   - $37,208 or 3% was expended for insurance, equipment/lab space rental and services not classified above.

2. Justification/Purpose of Expenditures—strategic overview
   a. New and/or transformative initiatives undertaken with ETF
      - Describe how your unit has used funds in progressive and innovative ways

      The College used its one-time allocation of funds to provide access to and enhancement of general biology and to acquire models for the new anatomy and physiology course laboratories. The Biological Sciences program totally revised the two-course introductory biology courses including additional 2007-08 labs. Other Teaching Laboratory Initiatives were implemented in response to increased enrollment in the Life Sciences including equipment for Genetics 412, bioreactor for Bioprocessing and a gel documentation system for Biochemistry. New technology concepts were taught using state of the art equipment.

      In Agricultural Education, this year’s allocation was spent on handheld electronic responders. These devices allow students in AEE classes to become more involved in the teaching-learning process. Students are also to receive feedback about their knowledge of the subject in a non-threatening manner.

      Biological Sciences purchased new software and molecular biology kits that allow new concepts to be investigated in the laboratory that previously could only be discussed in lecture. These innovations are continuing as the department revises the BIO 181 and BIO 183 curricula.

      Efforts to improve the Entomology teaching collections were increased this year through field collections and through sorting, culling, and categorizing current collections and by incorporating student collected materials into the general teaching materials. One new course, Forensic Entomology, and one course, Insect Pathology, that had not been taught in eight years following a faculty retirement, were taught in spring 2008. ETF funds allowed us to up fit each of those classes with extensive materials and supplies required for their lab sections. A multi-departmental effort to offer a curriculum in Agro-Ecology was supported by being able to provide ETF funds to purchase small grounds maintenance equipment for demonstration and hands-on teaching at a field site on the Lake Wheeler Field Lab Research Unit.

      The Food, Bioprocessing and Nutritional Sciences department encourages undergraduate research in FS 475, Problems and Design in Food and Bioprocessing Science, A Capstone Experience. Senior level students work in teams and present their completed research at the undergraduate research symposium. Projects for 2008 included cooperative efforts from the dairy industry and medical field. One of the new programs in the department is Bioprocessing Science and a large portion of this year’s equipment allocation was used for the purchase of two bioreactors. These are used for laboratories required in both the Bioprocessing Science and Food Science programs.

      This year Plant and Soil Science department purchased supplies needed to enhance the W. T. “Bill” Fike Agronomy Teaching Field Lab and the Turfgrass Field Lab and to establish an Agroecology Teaching Field Lab. These teaching facilities are extremely valuable educational tools and served students in numerous Turfgrass Science, Agronomy and Field Crop Technology classes.
Plant Biology purchased student microscopes and cameras to begin to establish a new microscopy laboratory in 2206 Gardner. Our previous shared (with Zoology) microscopy facility is no longer available to us, thus we need to establish a new lab. This lab will be used for graduate courses in “Plant Form and Function” and “Phycology”, as well as joint graduate/undergraduate courses on confocal microscopy and herbarium management.

Soil Science, responded to employer feedback that our graduates needed more skills in analytical techniques in the field, so SSC expanded the available field instrumentation and training to measure a variety of in situ properties and utilize GPS technology to handle the data.

Toxicology students placed priority upon the replacement of the Department’s real time PCR instrument (7000 Sequence Detection System) which is critical to the training of a large percentage of the students in the Department. Secondary to these purchases was the repair of existing lab equipment.

Plant Pathology, Plant Biology, and Zoology brought in world-renowned scientists to speak and meet with students.

- Describe how your unit continues to rethink and reassess use of funds to improve teaching/learning/business models to maintain nimbleness, adaptability, etc.

Biological Sciences continuously tries to improve our courses culminating with end-of-semester meetings to discuss ways to improve teaching/learning and leading to decisions on what changes should be made using ETF resources. For example, this year resources were allocated to developing virtual labs to improve efficiency of content delivery and also to be able to demonstrate some techniques and data generation/manipulation that are too costly to perform in “live” laboratories.

In Biological Sciences, enrollment in introductory biology has doubled over the past 5 years. To provide the highest return on ETF investments in these courses we have rearranged the laboratory settings and schedule to accommodate as many students as possible within a physical laboratory. We also have moved instrumentation among laboratories and courses to allow maximum use of the instrumentation. We have introduced new approaches to teaching some of the labs to allow pairs and teams of students to use more expensive consumables and instrumentation without sacrificing the hands-on experience of the individual student.

ETF funds were also used to obtain compact discs and videotapes as a supplement to enhance students' awareness and understanding of major biological concepts, processes, and techniques. The current high, effective utilization of this and related equipment is expected to increase with increasing enrollment.

More CALS classrooms, laboratories and building open spaces are wireless. Thus students have opportunities for real time activities in class, can work anytime via their computers and are not reliant on computer laboratories. Laboratories are scheduled for classes from 4.3% to 7.2% of the time. However, Scott 105 is scheduled 21% of the time but has been designated as the preferred lab for instructors to use who integrate computer instruction into their classes. Other times are independent and group student project work.

b. Actions taken to improve efficiency/return on ETF investments
- Describe your unit’s efforts to increase/maximize the value of ETF expenditures

The replacement computers had higher processor speeds and increased memory so students are able to process data, design and manipulate graphics and multitask quicker and more efficiently. Roving lab proctors increased assistance by 9% while maintaining the same operating hours. A total of 5900 operating hours were provided in the computer laboratories.

When reasonable, purchases are made in bulk to reduce the unit cost. Annual scheduled maintenance is promoted to extend the functional life of equipment purchased with ETF funds. ETF equipment and supplies are purchased with ETF dollars and used in several different classes to get the most “life expectancy” from the high-end equipment.
Toxicology’s Graduate Student Association (GSA) compiled ETF expenditure requests. Students placed priority upon maintenance of current facilities (instrument servicing, calibration, etc.) followed by the purchase of new items that would have multi-student applications (computers, spectrophotometer, etc.). Bestowing the responsibility of prioritizing purchases to the GSA ensured that purchases benefited the student body as a whole. This approach will be used during the next funding period.

ETF funds continue to support an undergraduate computer facility in the horticulture student study lounge that was moved into a larger room in the building. Horticulture students use this computer lab to prepare numerous documents and projects in their horticulture classes. ETF funds have allowed for the continual improvement and expansion of these facilities. Two new computer stations have been added and a larger more efficient printer has been added to this facility.

If not for the donations of plants, and additional supplies and materials made by private horticultural companies for specific course laboratories (Production of Floricultural Crops for example), our departmental ETF request would be that much greater. As a result, we have been able to maximize the value of the ETF expenditures.

In Agricultural and Resource Economics, some ETF funds were allocated for two out of state student trips: one to a national meeting and competition (in Kansas City) and one for students to travel to Washington DC to learn about agricultural policy and how it is designed. Student feedback from both trips was extremely positive. Successful efforts by students to obtain sponsorships for these trips lowered the costs we expected to allocate to these activities and allowed us to purchase computers.

In Microbiology, critical equipment is kept under maintenance contracts to assure continued availability and to lengthen the life of the equipment. Microscopes are insured against theft and damage. We budget a replacement cycle for small items such as pipetters, so that we don't have to replace a large number in a single year.

c. Unmet ETF-eligible needs

- Describe funding shortfalls for needs that could be funded by ETF

The College 2007-2008 Base ($1,136,856) and One-time ($227,606) funds fell short of the $2,702,217 dollars requested by departments. By spring 2008, departments projected a deficit of $710,099 in laboratory and related funds for the 2008-09 academic year. The 2007-08 one-time allocation of $227,606 was applied to departmental purchases of new equipment addressing changing technology and student enrollment increases. However, without an incremental increase in the base allocation in 2007-08 for maintenance and replacement, the equipment becomes antiquated and useless to students. Increasing numbers of students in CALS and to the university challenges the College in providing sufficient numbers of well-equipped laboratories and field experiences.

Biological Sciences is not meeting student demand in BIO 105/106, BIO 181, and BIO 183 introductory courses. We need funding to duplicate a physical laboratory for BIO 106 to be able offer enough sections and to duplicate a BIO181/183 laboratory so that we can offer those two courses in the “off semester” (BIO 181 in spring and BIO 183 in fall). We also are one of the few institutions in the UNC System that has no laboratory for the advanced biology courses in Cell Biology and Physiology. We need funds to outfit laboratories in these two courses. We also have an unmet demand in introductory human anatomy and physiology (BIO 301/302 and ZO 212) and would require funds to increase capacity in these courses. Demand is approximately double what we can provide. Zoology needs to outfit the new Yates Mill Pond ecology/environmental field lab with computers and laboratory equipment.

The computers used in the biology laboratories range from 4-11 years old. We need funds to replace these aging computers. We have other upper division courses with non-working and antiquated equipment, mostly microscopes. We will have to cancel at least one class (ZO 375) if we cannot repair the microscopes used in that class. Also Toxicology students recognize the need for centralized wireless internet access and an experiment imaging system.
Genetics Departmental funding was shifted to apply additional funds for laboratory supplies to allow additional laboratory sections to meet student demand. It is anticipated that additional funding will be required for the 2008-2009 academic year since the second teaching laboratory needs to be equipped for student use. Sections of GN 412 have already been scheduled for this space to accommodate student demand. Although some equipment can be shared between the two teaching labs, much of the equipment is used by the students during the class and will need to be purchased in order to teach the additional laboratory sections.

Horticultural Science has increasing needs for transportation vehicles for travel to and from classroom to field laboratory between Kilgore Hall and our new greenhouse facility and at the Horticultural Field Laboratory. Students are able to learn how to operate this equipment during lab. Drafting tables currently used in two landscape design studios are very old and in great need of replacement. We have begun to replace those tables with some ETF funds and will continue to do so when able. Students using these out-dated tables are at a disadvantage as they perform their design work in laboratory. The department envisions an increasing need for computer aided design. That would require the development of a computer aided design lab. The teaching committee and student representatives are working to develop a plan and budget for this facility.

Faculty research laboratories are not intended for teaching classes. This results in wear and tear on equipment purchased for research, not teaching. Some funds are needed to help with partial replacement of such equipment, or an equitable share of it in given labs for UG student researcher’s use.

Plant Biology’s ETF allocations are inadequate to fund the cost of major equipment needed for cutting-edge laboratories for our students. With costs of supplies, student salaries, and field trip expenses, we have only modest amounts of money left for equipment. We need additional student microscopes and cameras for new microscopy lab; another research grade microscope for the microscopy lab; computers to go with microscopes in microscopy lab; and a new growth chamber to grow plant material for introductory labs.

The Poultry Processing Teaching Laboratory is a new initiative in Poultry Science. Over 75% of the jobs in the poultry industry are within the processing area of our vertically-integrated broiler and turkey industries. The department routinely receives requests for trained students in this area and are currently unable to meet the demand. A pilot plant is under construction but a teaching laboratory needs to be equipped ($24,000).

With completion of the renovation of Soil Science’s two main undergraduate teaching laboratories, the opportunity exists to add new equipment to expand and improve the laboratory skills of students. One of these needs is a forced air convection oven for the soil fertility lab with a cost estimated at $3500. The lack of staff support for the overall teaching program often limits the intensity of some teaching activities, especially the field and laboratory components. Preparation of materials for labs, collection of soil materials from across the State, etc. are often less than desired. A staff person or instructor position would add needed continuity to the teaching program. Crop Science needs microscopes for the new teaching resources lab and student library in Williams Hall.

In general, the Plant Pathology ETF allocations are inadequate to fund the cost of major equipment needed for cutting-edge laboratories for our students. The development of an international plant disease diagnostic facility is hampered by the lack of funds to equip such a facility with modern technological equipment and microscopy systems. This facility would utilize state-of-the-art laboratory, visual and molecular apparati that would provide access to education and training in this important aspect of Plant Pathology in laboratory classrooms, national and international workshops and distance learning settings.

d. Assessment of impact of ETF investments on student learning
   • How and what does your unit measure to evaluate the effectiveness of ETF expenditures?
   CALS uses a multiple approach including: freshmen computer survey to determine needs; course evaluation questions relative to the laboratory experience are contained with each course evaluation; exit interviews of graduating seniors by the department head also address the student’s perceptions of
the quality of the laboratory experience. A majority of students express a high degree of satisfaction with the laboratories that they participate in. While these assessments indirectly measure the effectiveness of ETF expenditures, we believe that they adequately reflect student perceptions.

The explosive development in information technology has provided a new dimension to training in toxicology through the availability and use of bioinformatics tools. ETF funds have provided students the resources to learn new approaches in bioinformatics, generate new information using bioinformatic and biotechnological applications, and interact, both electronically and in person, with leaders in toxicological bioinformatics.

• In brief, what is your unit’s assessment of the impact of ETF investments on student learning

CALS students are continuing to use two large-format printers to create professional presentations for classes, symposiums and conferences. Quality posters provided students with a professional means to disseminate their research. Several won awards. For 2007-08, the college printed 1641 posters, including posters for three undergraduate research symposia and the undergraduate teaching symposium.

ETF investments were invaluable to student learning in a variety of settings including the laboratories where computer workshops are used substantially to enhance learning. Additionally, ETF funding enabled students to engage in experiential, hands-on learning with state of the art equipment at on-campus sites as well as during laboratory-related off-campus field trips.

e. Planning and review process

• Describe your internal review process and level of student participation

Each Department conducts its own planning and review process, often along with professional assessments such as CSREES, NCATE, ABET and other accrediting agencies. The College uses a team approach for identifying, prioritizing and assessing ETF needs. The College team includes: Dr. Barbara M. Kirby, Associate Director for Academic Programs; Dr. Gerry Luginbuhl, Assistant Director of Academic Programs; Mr. Jamie Dennis and Ms. Katie Lynch, CAAT; Dr. Andy Hale, Biological and Agricultural Engineering and Ms. Courtney Parnell, President of AgriLife Council. The administration discusses ETF issues with AgriLife Council members. Each of the 20 departmental committees includes the undergraduate and graduate coordinators, faculty members and students. Departments submit ETF requests to the CALS ETF web site. The site is open for review. The College committee reviews the requests and recommends allocations to the Associate Dean for Academic Programs. Each Department reports its expenditures annually to the College. Each year the need far exceeds the available funds by at least $500,000. Every effort is made to provide funds for courses, equipment maintenance and computing. A small amount is allocated for new initiatives when possible.

• List the names of all students involved with your ETF committee:

Agricultural and Extension Education: Autumnne Lowe, Sarah Brierton, Rebecca Ceney; Animal Science: Nicole M. Schnell, Senior SAS major, Leslie M. Nivison, Senior SAS major, Brynn S. Seabolt, M.S. student in Animal Science; Agriculture Resource Economics: Kerri Jacobs Perez and Mykel Taylor represented the (graduate students) and Tonya Dunn undergraduate (President of the NAMA club); Biological and Agricultural Engineering: Joe Wright (AET student) and Nicole Hill (BE student); Biology/Zoology: Sara Ashley Bumgardner and Tabitha Ikpechukwu (President of the Biology Club); Food, Bioprocessing, and Nutritional Sciences: Thomas Fuller (undergraduate), Suzanne Johanningsmeier (graduate); Genetics: Alejandro Merchan and Juan Rosario; Horticultural Science: Michael Harden, Horticulture Club President, Tanya Weyhrauch, ALCA team Captain, Emily Lumpkin, Horticulture Club Vice President, Christopher Hart, Horticulture Club CALS Agri-Life Representative, Dana Shelton, Student at large; Plant Pathology: Courtney Gallup, Heather Olson, Lee Miller, Faith Bartz, Elizabeth Schoenbaum, Leah Floyd, and Sara Ruark; Environmental and Molecular Toxicology: GSA representatives John House, Paul Ray, and Edward Croom. Other Departments report including students enrolled in courses in equipment/facilities assessments.


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<th>Expenditure Category</th>
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<td>CALS Base Allocation</td>
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<td>CALS One-time Allocation</td>
<td>$ 227,606</td>
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<tr>
<td>Biotechnology Allocation</td>
<td>$ 354,144  (See Biotechnology Report)</td>
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## Total Expenditures

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<th>Descriptions</th>
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<th>BIOTECH</th>
<th>Total Allocation</th>
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<td>519xx Contracted Services</td>
<td>Honorariums; Repair/service personnel</td>
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<td><strong>TOTAL PERSONNEL</strong></td>
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<td>Network charges and data services; freight &amp; express; computer/micro services; lab service agree</td>
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<td></td>
<td>Lab/course printing</td>
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<td></td>
<td>Repair &amp; maintenance contracts for equipment &amp; scopes</td>
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<td>54xxx Fixed Charges</td>
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The College and Departmental ETF end-of-year expenditure reports for last fiscal year (2007-08) are available for student review upon request. All ETF expenditure reports will be posted to the Provost’s website and will be accessible by anyone who has a campus unity ID. In addition, the CALS ETF 2007-2008 expenditure report may be viewed by selecting the College Home page http://www.cals.ncsu.edu/ Select For Faculty and Staff then ETF. A unity ID and login is required to access the ETF report. For questions, please contact Barbara_Kirby@ncsu.edu