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 26 graduate degree programs to 5,129 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 2006 – 2007 ETF allocation was $1,762,390 and included $354,144.00 for Biotechnology and $1,136,856.00 for CALS program needs. The College received an additional one-time allocation of $271,390 to: support access and enhancement of biological sciences; expand scientific teaching laboratory activities; and implement technology initiatives. The College also used one-time monies to support NCSU Undergraduate Programs by coordinating and printing 1,500 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 15% of the CALS ETF allocation. ($202,802.65).
   - $98,033.04 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.
   - $74,154.58 plus benefits was spent for student-workers/staff. These individuals include computer lab proctors and “wet” laboratory student assistants.
   - $4,280 for contractual services such as class speaker fees, serve contractors, repair personnel.

b. IT infrastructure, equipment and services (computing labs, networking, etc.)
   - $300,524 or 21% was expended for IT infrastructure, equipment and services. This included replacing 42 College-wide laboratory computers and purchasing computers integrated into 13 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.

c. Non-IT infrastructure, equipment (experimental labs, wet labs, etc.)
   - $721,564.96 or 51% of the allocation was spent for non-IT or laboratory equipment. Life Sciences invested in equipment teaching the latest technology in Biological Agricultural Engineering, Plant Biology, Genetics, Biochemistry and Microbiology. Poultry Sciences purchased equipment for the new Feed Mill minor program. Introductory Biology purchased equipment for additional lecture/labs required by adding an additional lecture section of Biology 105 and additional seats in Biology 181 for new freshmen. One-time funds assisted greatly in repairing equipment.

d. Facilities (repairs and renovations, furniture, etc.)
   - $55,605 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.
   - $97,273 or 7% was expended for travel. This is a 2% or $35,000 increase over last year to accommodate the increased number of students in laboratory classes. Funds support field trips to
business and industry but primarily 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

$30,963 or 2% 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. The Biological Sciences program totally revised the two-course introductory biology courses including additional 2006-07 labs. Other Teaching Laboratory Initiatives were implemented in response to increased enrollment in the Life Sciences. Specifically Genomics, Bio-Processing, Metabolomics and DNA Amplification Technology concepts were taught using state of the art equipment. While College-wide laboratories replaced outdated machines, the focus was on “Integrating Instructional Technology to Increase Student Computing Access and Laboratory Information Processing” throughout 13 departments.

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. Plant Biology purchased GPS and physiological ecology equipment (porometer, fluorometer) to enhance field labs in ecology and systematics courses.

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

In Poultry Science, a significant amount of the total funding (one-time) was directed toward transformative initiatives involving biotechnology applications and the new feed science initiative associated with the new NCSU feed mill. This is consistent with emerging poultry industry demand for training and opportunities in these areas. With the modest amount of funding available and the recent investments by the college in the areas of biotechnology and feed science, we felt this was an appropriate way to leverage these funds to the maximum benefit of our students.

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

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.
In Zoology, more than 1200 undergraduate students and 70 graduate students benefited from ETF funds. This translates to an efficiency of approximately $70 dollars per student, a very conservative figure considering the expense of modern lab equipment, biotechnology reagents and computer technology. This efficiency is attained by teaching labs of 24 students, having shared computer facilities for undergraduate and graduate students, and having students work together whenever possible.

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 10% of the time for 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.

  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.

  In Microbiology, the use of the funds was prioritized to ensure that the standard content of each course could be covered. The department received a one-time allocation that was used to purchase 2 autoclaves, critical pieces of equipment for the new teaching laboratory preparation room. The purchase of 2 through the bid process and with sufficient lead-time resulted in a savings of $40,000. The renovation of our teaching space in Gardner Hall necessitated the purchase of this 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.

  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 San Antonio) 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 2006 – 2007 Base ($1,296,568) and One-time ($832,629) requests exceeded the current ETF allocation by $820,000. The 2006-07 one-time allocation of $271,390 was applied to departmental purchases of new equipment addressing changing technology and student enrollment increases. However, without an incremental increase in the base allocation 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.

In Soil Science, the greatest need in our teaching program has been the renovation of our teaching laboratories. Conditions of the facilities clearly affect student learning and limit our ability to utilize the latest technology. Student comments on course evaluations always include negative remarks on the facilities. The renovation of these labs beginning June 2007 will create the need for new equipment that can now be accommodated. Some of the priority needs will be ceiling mounted computer projectors not included in the renovation at an estimated cost of $10,000. A forced air convection oven for the soil fertility lab is estimated at $3500.

Horticulture 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.

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 researchers use.

Zoology needs to outfit the new Yates Mill Pond ecology/environmental field lab with computers and laboratory equipment. Crop Science needs microscopes for the new teaching resources lab and student library in Williams Hall.

In Plant Pathology 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.

New degree programs in the College including Nutrition Science, Turfgrass Management, Bioprocessing Science will submit ETF requests for lab and computing supplies. Without an increase to the College ETF Base allocation, the new programs will impact the base allocation to the detriment of other departments if the base remains constant.

Other CALS buildings without wireless access need to be included in the campus wireless plan. The Toxicology building on Centennial Campus requires centralized wireless Internet access.

Biological Sciences is in the process of major course revisions for BIO 181 and BIO 183, scheduled for implementation in fall 2007. They developed semester long projects in both courses and greatly increased and modernized the approach to teaching cell and molecular biology in BIO 183. However, they have insufficient instrumentation and supplies to fully implement the semester long projects and we have inadequate cell and molecular biology instrumentation and lab kits to provide a modern laboratory experience that is consistent with the changes in the BIO 183 lecture. Funds are needed to obtain additional equipment and supplies to provide a learning experience that is equivalent to our peer institutions.

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.

Through exams, quizzes, presentations and lab reports students demonstrate proficiency with the equipment and mastery of new technology. Successful graduates are employed in agencies using new and emerging technology and employers indicate satisfaction with graduates.

- 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 2006-07, the college printed 1500 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. ETF made it possible for the College to equip additional labs in Biology to meet the growth in student population thus students were able to progress in their degree programs.

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, NCAE, 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, Assistant Director for Academic Programs; Mr. Thomas Young, Assistant Director of CAAT; Dr. Any Hale from the Academic Computing Advisory Committee; and Dr. Gerry Lugnibuhl, Undergraduate Teaching Coordinator and Department Head for Microbiology. College student representatives included Kathryn Price and Camber Howard. 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:
  Plant Pathology Undergraduates: Undergraduate survey and TAs; Microbiology: Mary Claire Garrison, undergraduate student, and Mr. Justin Pollara, graduate; Poultry Science: Sarah Walters, Heather Cutchin, and John Small; Biological and Agricultural Engineering: Joe Wright (AET student) and Rachael Boone (BE student); Toxicology: Graduate Student Association members; Biology: Bumgardner, Sara Ashley Hill, Lisa Marie McDowell, Kelli Ammiesha (President of the Biology Club); Crop Science: Crop Science GSA and Michael Brewington and Joni Williamson (undergraduate students); Entomology: We use the officers (President and VP) of the Entomology Graduate Student Association Kateryn Rochon and Adrial Duehl; Horticulture: Trey Warrick, Cody Yandle, Brett Fisher, Christopher Hart, Faith Marie Hasz; Food Science: Leslie Gentry (undergraduate), Tristan Berry (graduate); Animal Science: Warren A. Goodwin, Jason A. Wright, Bianca M. Thompson; Anthropology & Sociology: Jennifer Marks; Agricultural and Extension Education: Kate Bresaw, Haley Hampton, Sarah Brierton, Tony Benavente; Animal Science: Anna Weist, Stacy Mabe, Stephanie Hanson, and Laura Cashion; Agricultural Resource Economics: Kerri Jacobs Perez and Mykel Taylor, graduate students and Karen Brandt is an undergraduate (President of the NAMA club).
3. **Itemized List of Expenditures by Account Code**

- **CALS Base Allocation:** $1,136,856
- **CALS One-time Allocation:** $271,390
- **Biotechnology Allocation:** $354,144 (See Biotechnology Report)
- **TOTAL:** $1,762,390

**Fiscal Report**

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<th>Object Code and Expense Category</th>
<th>Descriptions</th>
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<th>BIOTECH</th>
<th>Total Allocation</th>
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<td>Repair &amp; maintenance contracts for equipment &amp; scopes</td>
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The College and Departmental ETF end-of-year expenditure reports for last fiscal year (2006-07) 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 2006-2007 expenditure report may be viewed by selecting the College Home page [http://www.cals.ncsu.edu/](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