

# Academic Program Review

## Master of Science Programs Self-Study Report 2005 to 2009



College of Agriculture, Food and Environmental Sciences

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## Standard Program Information

### College of Agriculture, Food & Environmental Sciences (CAFES) Graduate Programs

#### *Program (CAFES) Mission Statement*

The College of Agriculture, Food and Environmental Sciences uses a “Learn by Doing” approach to prepare leaders in agriculture, food systems, and environmental and life sciences who are equipped to contribute to the diverse needs of society.

The CAFES Graduate Programs office is in the CAFES Deans’ Office, room 11-211 located on the second floor of the Agricultural Sciences Building.

*Department Website:* [http://cafes.calpoly.edu/about\\_cafes/grad\\_programs.html](http://cafes.calpoly.edu/about_cafes/grad_programs.html)

#### *Programs of Study/Specializations Available\**

- [Master of Science in Agribusiness](#)
- [Master of Science in Agriculture with Specializations in:](#)

- *Agricultural Education*
- *Agricultural Engineering Technology*
- *Animal Science*
- *Crop Science*
- *Dairy Products Technology*
- *Environmental Horticultural Science*
- *Food Science and Nutrition*
- *Irrigation*
- *Plant Protection Science*
- *Recreation, Parks, and Tourism Management*
- *Soil Science*

- [Master of Science in Forestry Sciences](#)

\*Note [M.B.A., Agribusiness Specialization](#): The Orfalea College of Business and the Agribusiness Department jointly offer an Agribusiness Specialization in the Master of Business Administration program. [M.S. General Engineering, Water Engineering Specialization](#): The College of Engineering and the BioResource and Agricultural Engineering Department jointly offer the Water Engineering Specialization under the M.S. Engineering program.

As of Fall Quarter 2009, CAFES employed a total of **98** Tenure-Track Faculty, **40** Lecturers, **3** Instructors, and **59** Staff.

In Fall Quarter 2009, a total of **120** M.S. students were enrolled in all CAFES graduate programs combined. A total of **352** M.S. students are in good standing (within 7-year time limit).

No separate *operating budget* account exists to directly support the CAFES M.S. program. However, 55% of Melanie Gutierrez’ (CAFES Graduate Program Assistant) position and approximately 25% of Mark Shelton’s (CAFES Associate Dean) position are dedicated to supporting CAFES graduate programs. In addition, CAFES Grants Analyst, Sue Tonik,

contributes time to both CAFES graduate students and their faculty mentors as she assists them with research proposals and grant-funded research assistantships.

***CAFES Specialized Facilities*** which support research and graduate studies are listed below.

- Animal Science labs
- Animal Nutrition Center
- Beef Center
- Equine Center
- Poultry Center
- Swine Center
- Biofuels research greenhouse
- Irrigation Training & Research Center labs/water delivery facilities
- Dairy Science labs
- Dairy Products Technology Center labs
- Erosion Research lab
- Soil Analytical lab
- Soils Analytical Instruments lab
- Soils lab Annex
- Food Safety lab
- Nutrition lab
- Tissue Culture lab
- Arboretum
- Crops Unit greenhouses
- Environmental Horticulture Unit greenhouses
- Fruit Processing Line
- Horticulture & Crop Science Analytical lab
- Pesticide Handling Facility
- Plant Tissue Culture lab
- Postharvest lab
- Wine lab
- Geographic Information Systems (GIS) labs
- Swanton Pacific Ranch facilities

***Graduate Student Office Space*** - though very limited overall, space has been made available for some of our graduate students in the following programs:

- *Animal Science* – Nutrition, genomics areas
- *Agricultural Engineering Technology* – Biofuels
- *Dairy Products Technology*
- *Irrigation*
- *Soil Science*
- *Food Science & Nutrition*
- *Forestry Sciences*

***List of Urgent Space Needs:***

- Graduate student office space (beyond areas listed above)
- Wet lab research space; this could be shared among departments

## Executive Summary

CAFES graduate students demonstrate evidence of creative scholarly activity and professional development through writing quality theses and dissemination of their original research findings. In addition, employer surveys of M.S. Agriculture, Agricultural Education specialization graduates indicates a strong perception that students have gained professional competency and possess characteristics desired in professional educators.

CAFES M.S. program enrollment has been steady over the last five years, with approximately 120 students enrolled each fall. Total headcount of graduate students in good standing is 352. Females comprised between 52 and 65% of CAFES graduate students during the review period, with considerable majorities in our Agricultural Education and Food Science & Nutrition specializations. Non-white enrollment in CAFES graduate programs is weighted towards Hispanic/Latino students, though modest numbers of Asian American, Native American, African American, and non-resident alien students are regularly enrolled. Two multi-racial CAFES M.S. students were enrolled in fall 2009, when statistics for this demographic group were first available.

Approximately 42 M.S. candidates graduate each year, with similar gender breakdown as overall enrollment, except in 2007-08, when 70% of CAFES M.S. graduates were women. Of the 206 CAFES M.S. degrees awarded, 2004-2009, 100 theses were completed and archived in the Cal Poly Library. The 102 non-thesis degree students (70 female & 32 male) graduated from our M.S. Agriculture - Agricultural Education degree program and 4 General Agriculture specialization students with the non-thesis option, also completed their degree requirements.

University financial support of graduate students comes via sponsored research grants of faculty, CAFES endowment support, Research & Graduate Programs fellowships and tuition waivers, loans, Federal Work Study, and need-based State University Grants.

CAFES graduate students have been awarded the University's Outstanding Graduate Student or Outstanding Thesis awards in four of the five years of this review cycle.

A survey of public school administrators indicated that M.S. Agriculture, Ag Education Specialization alumni possessed the key attributes sought in California agriculture teachers. Cal Poly/CAFES learning outcomes and California Agriculture Teacher's Association/California Department of Education learning outcomes/standards were attained by our alumni, according to survey responses, though *Special Needs* and *English Language Learner* skills were somewhat lacking.

Results of an employer survey of thesis-based M.S. alumni were not available at the time of this writing, due to a very small pool of accurate contact addresses.

Our survey of current CAFES graduate students revealed that a majority of respondents felt their graduate program was preparing them to demonstrate expertise and the use of technology in their discipline as well as evaluate and solve problems using critical thinking, the key learning

outcomes of interest in this self study. However, many respondents cited lack of office space and other expected resources in a graduate program as frustrating.

Faculty focus groups indicated that while our CAFES graduate programs are important to support research and elevate scholarship at the University, resources to support the programs are limited. Departments varied in their support for research and graduate programs. Formation of a CAFES Graduate Faculty is seen by some as critical to strengthening our graduate programs. This may improve our efficiency in delivering courses and mentoring students, particularly across departmental lines.

A review of randomly selected CAFES M.S. theses from 2004–2009 indicated that most theses substantially or fully met key learning objectives such as demonstrating original thinking, use of appropriate research methods, and clear identification of a relevant question or problem. As reported in our last program review (2005) several theses failed to explicitly state a testable hypothesis or analyze quantitative data, though overall improvement was reported in thesis quality compared to our earlier review.

University Learning Objectives appear to align fairly well with CAFES M.S. curricula.

## Self Study Narrative

### M.S. Programs Selected for Review

Our initial charge was to review selected CAFES M.S. programs during the 2005–2009 cycle, with others to follow in later years. Upon our request, Vice Provosts Erling Smith and David Conn agreed to a simultaneous review of all CAFES graduate programs, listed below.

- M.S. Agribusiness
- M.S. Agriculture
- M.S. Forestry Sciences

### Program Representatives

The program representatives (those charged with conducting the self-study) for this review of CAFES M.S. programs:

- Dr. Mark Shelton, Associate Dean and Graduate Coordinator, CAFES M.S. program (Program Administrator)
- Ms. Melanie Gutierrez, CAFES Graduate Program Assistant

### Selection of Review Team Members

According to the academic program review guidelines, described in the *Report on Institutional Accountability* (2000), each academic program chair (CAFES Graduate Coordinator, in this case) is to consult with their college dean to identify two external reviewers and one internal reviewer outside of the college whose program is under review.

In fall, 2009, we queried the CAFES faculty about a list of prospective external reviewers for the M.S. program review team. After consideration of faculty input, we consulted with CAFES Dean, David Wehner, and came to agreement to nominate the following individuals:

- Dr. Chris Calvert, Professor with the Department of Animal Science at the University of California, Davis
- Dr. Scott Stephens, Associate Professor with the Department of Environmental Science, Policy & Management at the University of California, Berkeley

Each nominee was contacted and both agreed to serve as reviewers. These names were then submitted to Dean Wehner and Vice Provost Erling Smith for approval. The CAFES Graduate Coordinator then mailed letters to each reviewer to confirm their appointments as external review team members.

We then considered several Cal Poly faculty outside the CAFES, to serve as part of the review team. Following consultation with Dean Wehner, we decided to ask Dr. Unny Menon to serve, and he agreed. His name was then submitted to the Academic Senate via the APR 'Internal Review Nomination Form', to be voted on by the senate. The Academic Senate Executive Committee Meeting Minutes from November 10, 2009 records the Senate's affirmative vote.

Thus, our CAFES M.S. Program Review Team members are:

Dr. Chris Calvert – External reviewer  
Dr. Scott Stephens – External reviewer  
Dr. Unny Menon – Internal reviewer



### **CAFES Faculty Involvement in Self Study**

Faculty serve as departmental coordinators for each specialization/degree within the CAFES graduate program. These faculty serve as early contacts for prospective graduate students and application reviewers. All agreed to assist with the self-study process and are listed below:

*Agribusiness* – Dr. Jim Ahern

*Agricultural Education & Communication* – Dr. Bob Flores & Dr. Bill Kellogg

*Agricultural Engineering Technology* – Dr. Richard Cavaletto

*Animal Science* – Dr. Robert Delmore

*Crop Science* – Dr. Michael Costello

*Dairy Products Technology* – Dr. Rafael Jimenez-Flores

*Environmental Horticulture* – Mr. David Hannings

*Food Science & Nutrition* – Dr. Scott Reaves

*Irrigation* – Dr. Charles Burt

*Natural Resources Management* – Dr. Doug Piirto

*Plant Protection Science* – Dr. David Headrick

*Recreation, Parks and Tourism Management* – Dr. Bill Hendricks

*Soil Science* – Dr. Lynn Moody

The CAFES Graduate Studies & Research Committee provided input regarding the self-study theme and developed the instrument for a Survey of Current CAFES M.S. Degree Students. Two CAFES faculty focus groups met to provide input on graduate program strengths and weaknesses. Finally, selected CAFES faculty agreed to serve as quality reviewers for 10 randomly selected M.S. theses completed 2004-2009.

### **Progress on 2003-05 Academic Program Review Action Plan**

Since the last CAFES M.S. Academic Program Review was completed, we have addressed a number of items listed in our Action Plan (Appendix A), including:

- Identified department-level graduate coordinators for master's application review
- Upgraded graduate student database to track progress to degree
- University Housing Office designated 4 spaces in Cerro Vista complex for CAFES graduate students
- Produced *Graduate Programs Reference Guide* in 2007; update annually
- The *Master's of Agricultural Education* degree was approved, 2010
- Email list of 500-level courses available to CAFES graduate students each quarter

### **Other Improvements to our Master's Degree Program since 2005**

A new dual-M.S. degree program was established in 2008 between CAFES and Shanghai Jiao Tong University (SJTU). Each year two SJTU graduate students will be admitted and provided non-resident tuition waivers along with research assistantships, while completing the M.S. in Agriculture, specializing in Dairy Products Technology.

All M.S. theses are now digitized and electronically accessible via the Cal Poly Library's [Digital Repository](#), 2008

We required Graduate Record Exam (GRE) General Test scores and three letters of recommendation for all thesis-based M.S. applicants, effective 2009

We changed the [graduate application deadlines](#) for domestic M.S. applicants to April 1 for Summer/Fall applicants and October 1 for Winter/Spring applicants to improve our responsiveness, 2009

At our request, the University adopted a [Continuous Enrollment Policy](#) for all graduate students, effective Fall Quarter 2009

At our request, the Library installed [45 lockers for graduate student quarterly use](#), 2010

Following a CAFES Graduate Studies & Research Committee review of letters of recommendation formats from various universities, we created a new template, effective 2011

### **Self-Study Issue**

By its very nature, graduate study requires a degree of independent performance by the student beyond that expected of undergraduates. Graduate students are expected to use the learning and critical thinking skills acquired as undergraduates to independently solve research problems, or develop and conduct creative projects. These efforts go far beyond the successful completion of classes, which are also part of the graduate school experience. Thus, it is largely the expectation of individual performance in new scholarly or creative endeavors that distinguishes graduate studies from undergraduate. In our effort to assess the degree to which CAFES graduate students demonstrate independent scholarship and professional growth, we proposed the following self-study issue to focus on in this program review:

#### ***Creative Scholarly Activity and Professional Development by Graduate Students***

This proposal was approved by CAFES Dean Wehner, Research and Graduate Programs Dean Susan Opava, and Vice Provost Erling Smith. Evidence to support this study includes student publications, presentations, and other professional work that demonstrates creative scholarship and professional development. Employer survey responses also indirectly address student professional development.

CAFES graduate students present their original research orally and via display posters at State, regional and international meetings. Less often, they publish their findings in technical reports, meeting proceedings/abstracts, and in peer reviewed journals. This research dissemination is perhaps the best evidence of creative scholarly activity and professional development by our graduate students, though there is clearly room for improvement, particularly in scholarly publication of thesis work.

For those students who have written a high quality thesis or whose employer indicates (via our survey) attainment of technical competency and professionalism, we have further evidence of scholarship and/or professional development.

## Graduate Program Data

### CAFES M.S. Enrollment and Degrees Awarded Statistics

Cal Poly's Office of Institutional Planning and Analysis (IP&A) provided historical data on applications, admissions, enrollment and degrees awarded for the 2005-2009 Academic Program Review cycle. These key graduate program statistics are graphically represented below. Figures 1a and 1b compare the numbers of applications received and selected between the University and the CAFES graduate programs. Selectivity rates for men vs. women applicants were similar for both CAFES and the University during the 2005-2009 period.

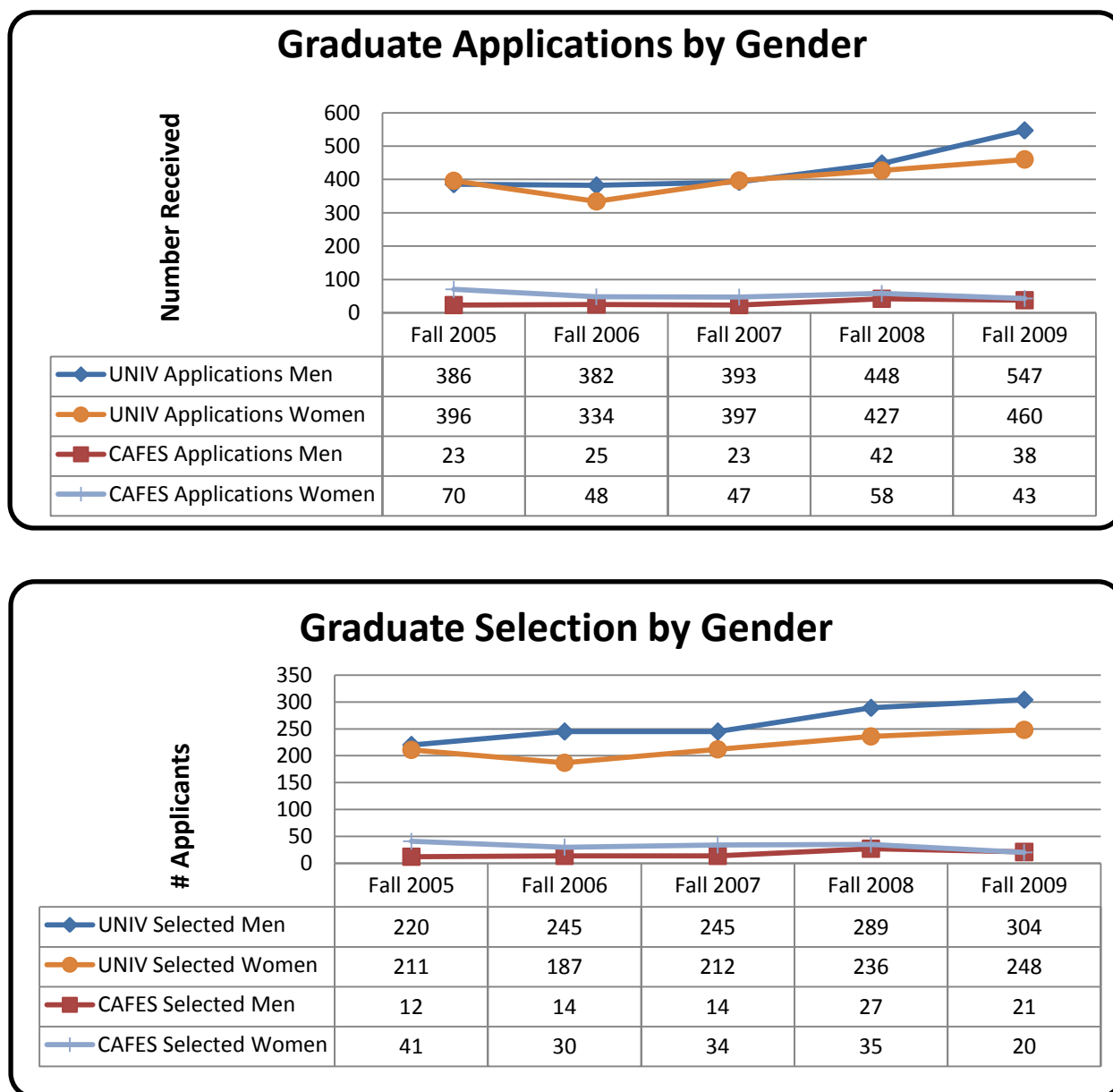
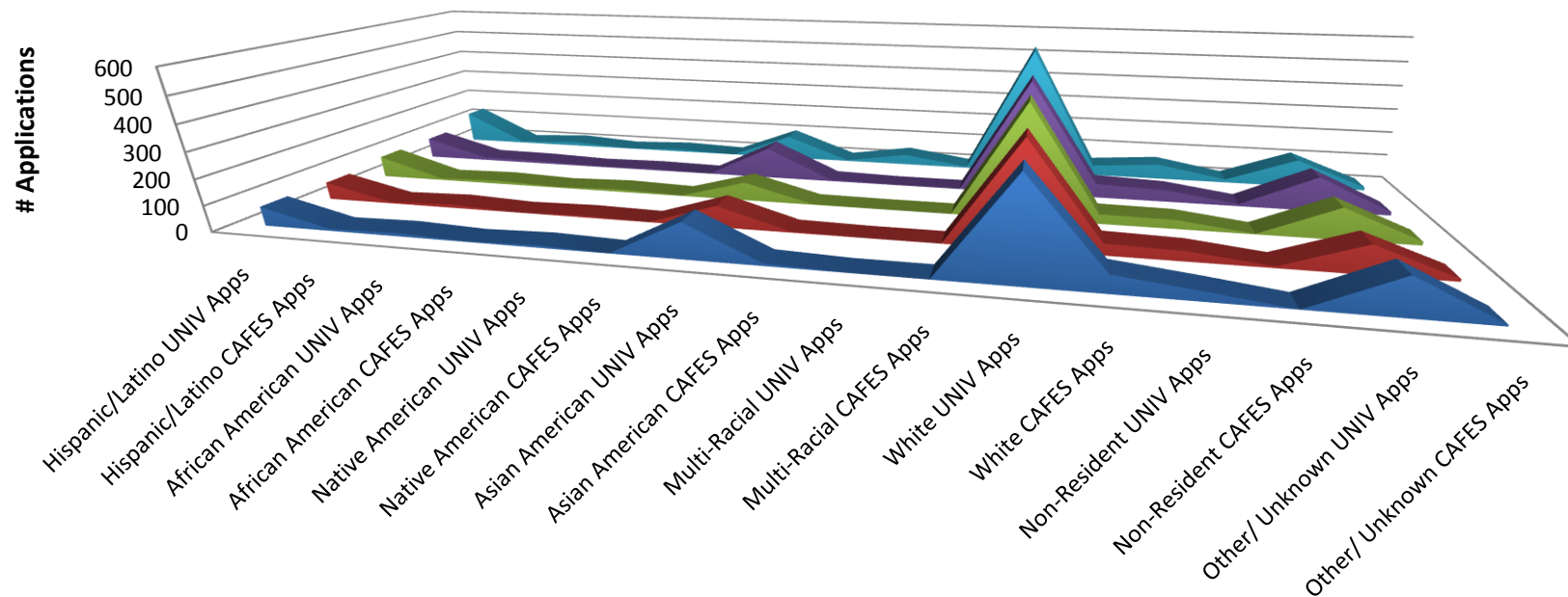


Figure 1a and 1b – Cal Poly Graduate Applications & Selection by Gender, 2005-2009

Figures 2a and 2b below reflect the diversity of applications received and selected by CAFES and University-wide graduate programs.

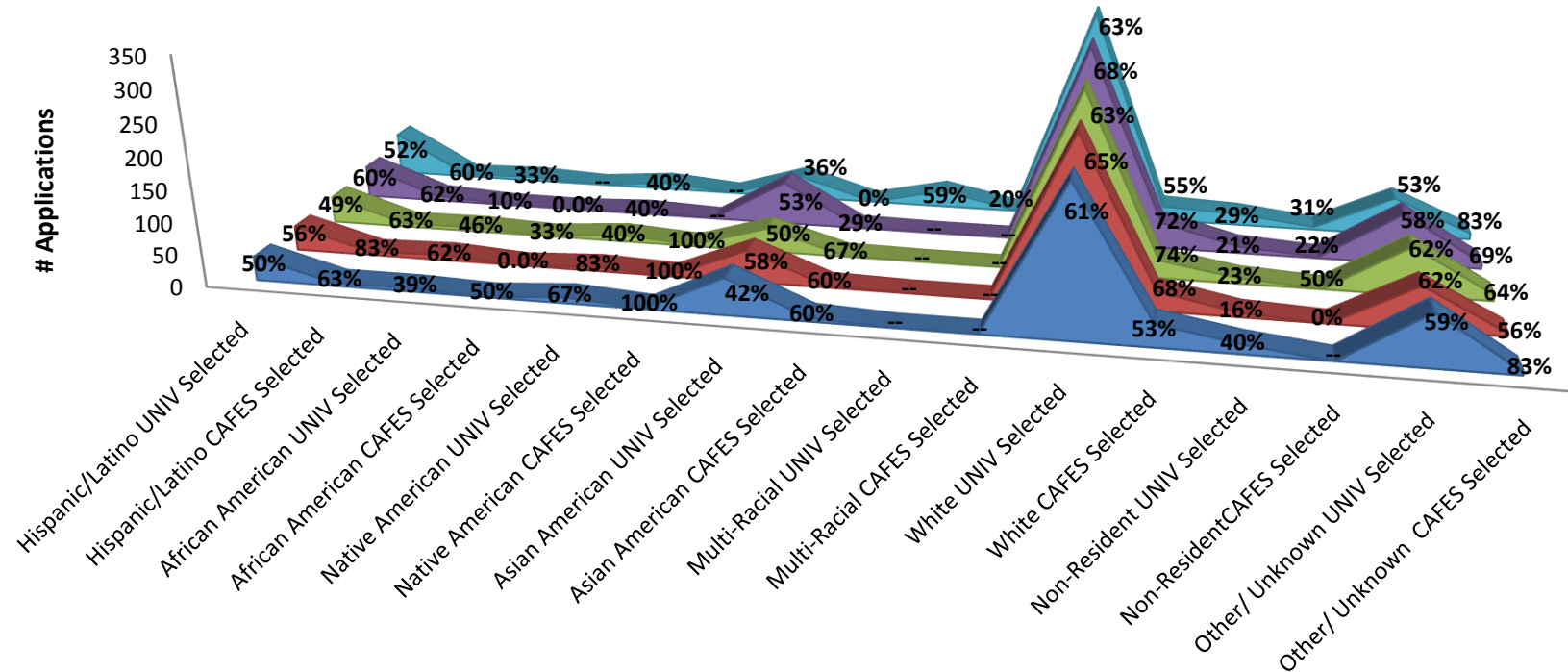
### Ethnic Origin of Graduate Applications



	Hispanic/Latino UNIV Apps	Hispanic/Latino CAFES Apps	African American UNIV Apps	African American CAFES Apps	Native American UNIV Apps	Native American CAFES Apps	Asian American UNIV Apps	Asian American CAFES Apps	Multi-Racial UNIV Apps	Multi-Racial CAFES Apps	White UNIV Apps	White CAFES Apps	Non-Resident UNIV Apps	Non-Resident CAFES Apps	Other/Unknown UNIV Apps	Other/Unknown CAFES Apps
Fall 2005	74	8	13	2	9	1	136	10	0	0	379	66	35	0	136	6
Fall 2006	68	6	13	1	6	1	84	5	0	0	401	44	37	7	107	9
Fall 2007	86	8	13	3	10	2	74	3	0	0	450	38	35	2	122	14
Fall 2008	85	13	10	1	5	0	128	7	0	0	464	57	47	9	136	13
Fall 2009	131	5	18	0	10	0	100	4	44	5	529	42	62	13	113	12

Figure 2a – Ethnic Origin of Cal Poly Graduate Applications, 2005-2009

### Ethnic Origin of Graduate Applications Selected



	Hispanic /Latino UNIV Selected	Hispanic /Latino CAFES Selected	African American UNIV Selected	African American CAFES Selected	Native American UNIV Selected	Native American CAFES Selected	Asian American UNIV Selected	Asian American CAFES Selected	Multi-Racial UNIV Selected	Multi-Racial CAFES Selected	White UNIV Selected	White CAFES Selected	Non-Resident UNIV Selected	Non-Resident CAFES Selected	Other/Unknown UNIV Selected	Other/Unknown CAFES Selected
Fall 2005	37	5	5	1	9	1	57	6	0	0	232	35	14	0	80	5
Fall 2006	38	5	8	0	6	1	49	3	0	0	260	30	6	0	66	5
Fall 2007	42	5	6	1	10	2	37	2	0	0	285	28	8	1	75	9
Fall 2008	51	8	1	0	5	0	68	2	0	0	314	41	10	2	79	9
Fall 2009	68	3	6	0	10	0	36	0	26	1	334	23	18	4	60	10

Figure 2b – Ethnic Origin of Cal Poly Graduate Applications Selected, 2005–2009

White applicants made up an average of 58.9 and 53.4% of applicants to CAFES and University graduate programs, respectively, during 2005-2009, with few African American, Native American, or Multi-Racial applicants. Hispanic/Latino and Asian American students comprised significant proportions of non-white applicants and selected students in CAFES and the University (Figs. 2a, 2b). CAFES selected a higher average percentage of Hispanic/Latino applicants than the overall University, from 2005-2009.

Though data were not analyzed for individual M.S. degree programs, anecdotal evidence indicates that our Food Science & Nutrition, Animal Science, and Agribusiness M.S. programs are consistently more selective than other CAFES M.S. graduate programs. This is partly due to the relatively large number of applications received by the first two programs, and relatively small number of Agribusiness faculty willing to supervise graduate students.

Overall selectivity of graduate programs was similar between CAFES and the University, generally ranging between 50 and 60% acceptance. CAFES yield (% of selected graduate students who chose to enroll) was higher than the overall University in all study years except 2007 as reflected in Table 1 below.

**Table 1 – Graduate Applicant Selectivity & Yield (%) 2005–2009**

	Fall 2005		Fall 2006		Fall 2007		Fall 2008		Fall 2009	
	Applicants Selected	Yield	Applicants Selected	Yield	Applicants Selected	Yield	Applicants Selected	Yield	Applicants Selected	Yield
<b>University</b>	55.1	62.9	60.3	72.7	57.8	72.4	60.0	68.8	54.8	69.2
<b>CAFES</b>	57.0	73.6	60.3	93.2	68.6	68.8	62.0	72.6	50.6	82.9

Figures 3a and 3b show the totals of graduate students enrolled in courses each fall quarter. Data does not include matriculated, continuing students whose coursework is completed, for example. When these non-enrolled M.S. candidates are counted, 352 CAFES graduate students are within the 7-year time limit as of Fall 2009 Quarter.

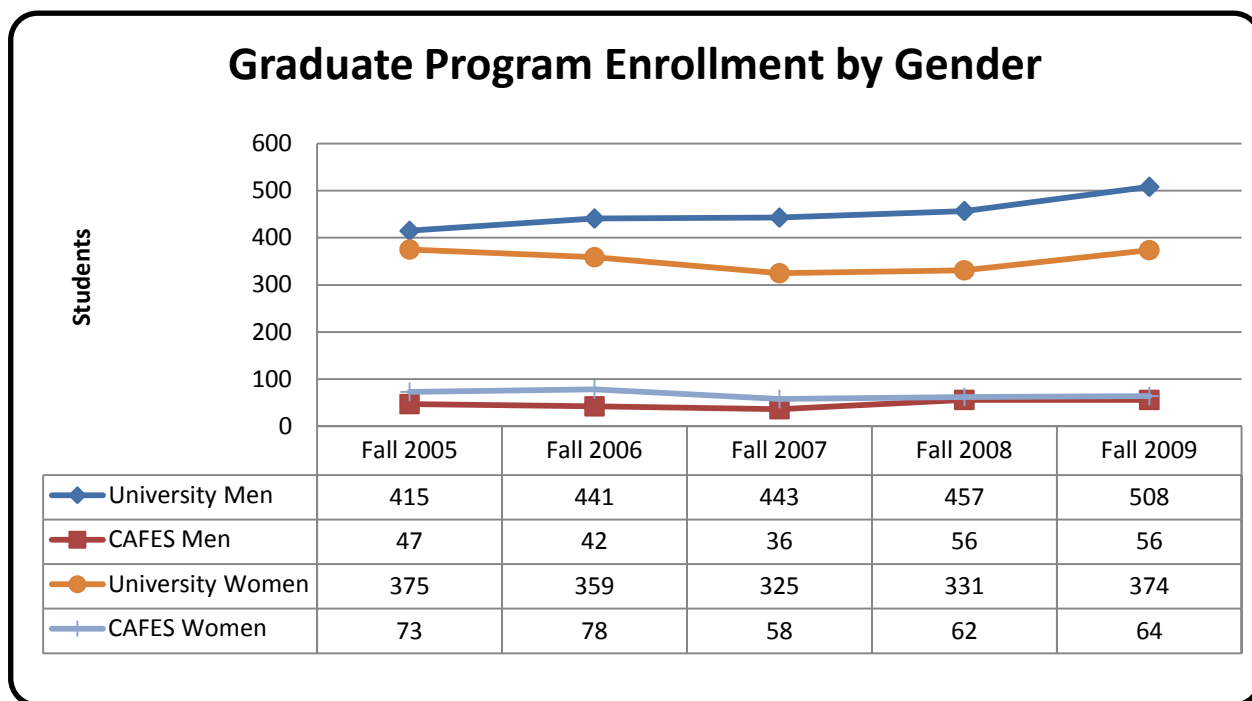
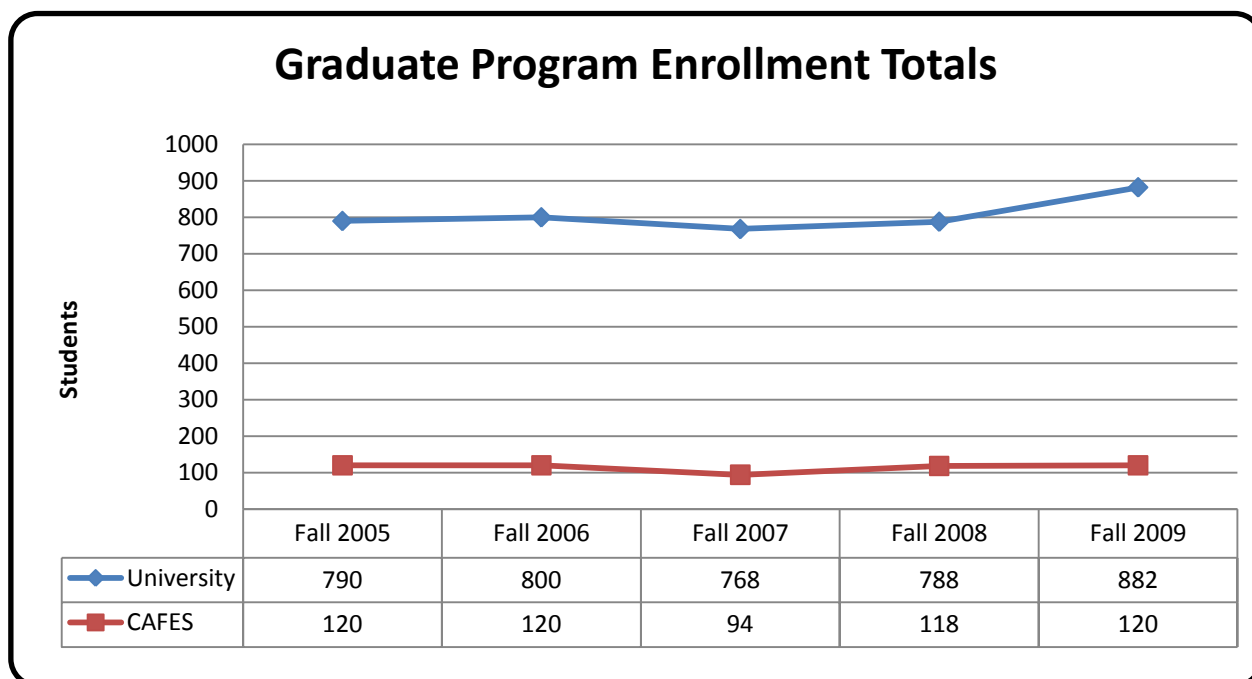


Figure 3a and 3b – Cal Poly Graduate Enrollment, 2005-2009

Figures 4a and 4b show the totals of master's degrees awarded each "College Year" (CY), which is defined by IP&A as Summer, Fall, Winter, and Spring Quarters. The CAFES degree total is compiled from the M.S. Agribusiness, M.S. Agriculture and M.S. Forestry Sciences data. Specific totals for each degree program and/or specialization are available upon request.

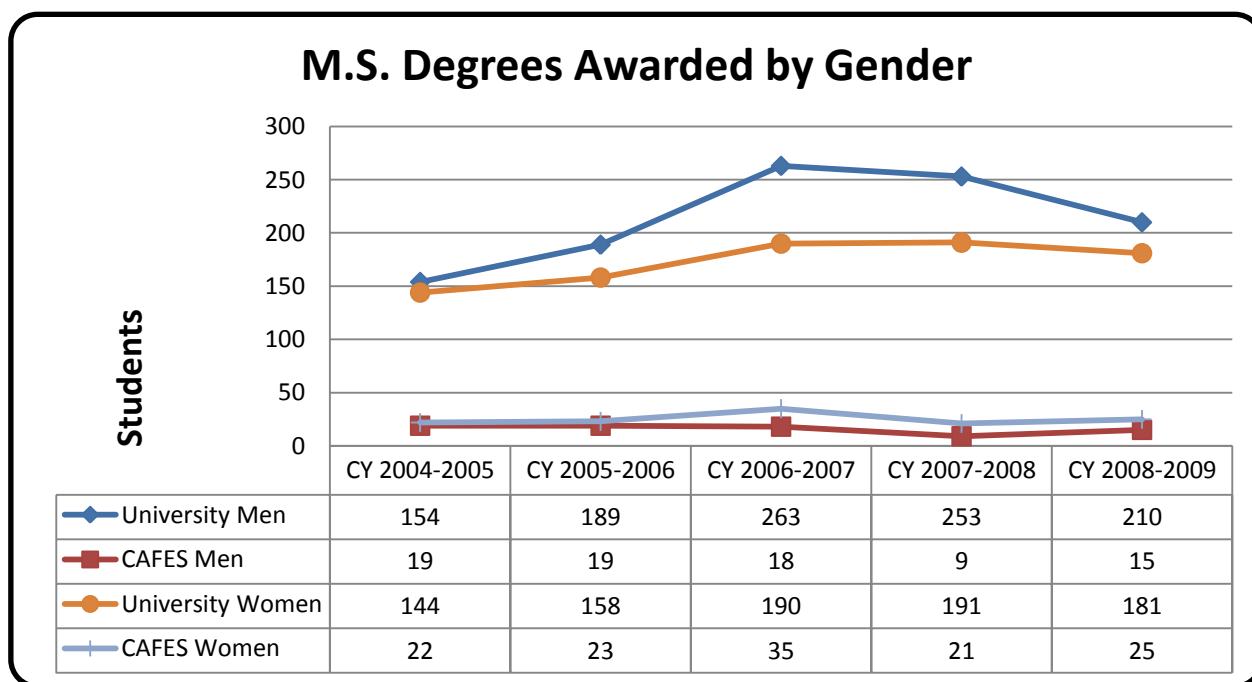
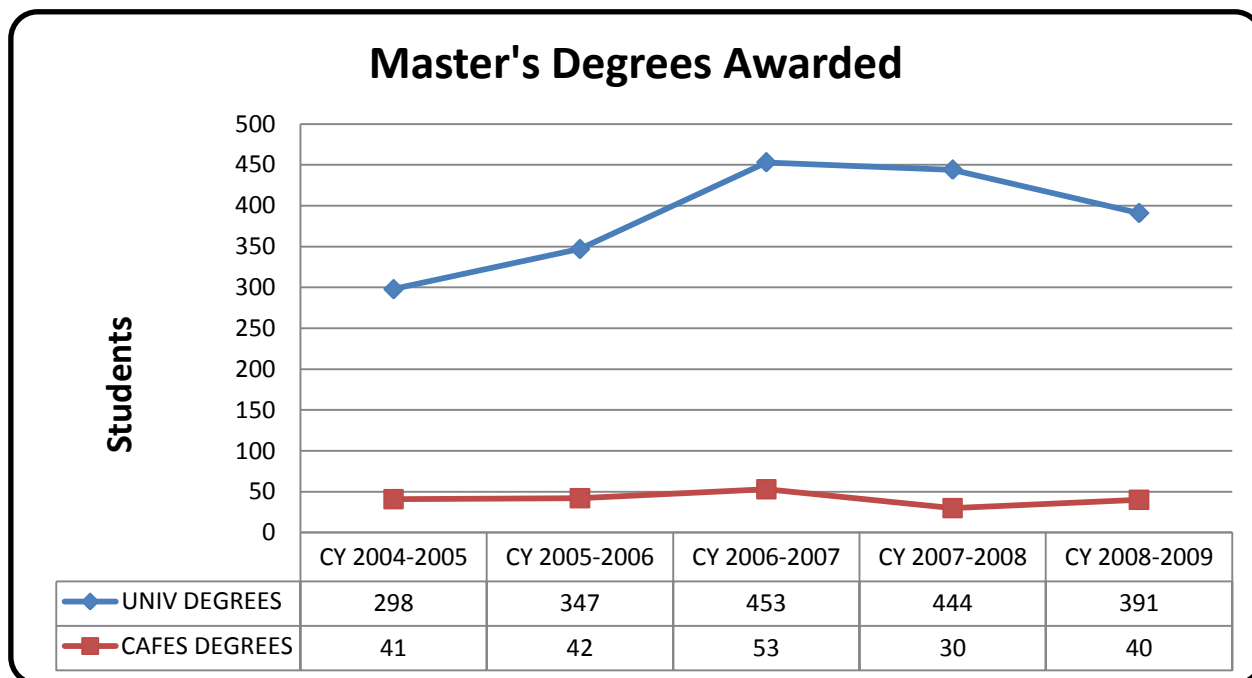


Figure 4a and 4b – Cal Poly Graduate Degrees Awarded, 2005-2009



### Graduate Status Report Information

Table 2 below summarizes M.S. Agriculture graduates' responses to the Career Services employment survey disseminated to each graduating class annually.

**Table 2 – Graduate Status Report Data, M.S. Agriculture Degrees Awarded 2004–2009**

Master of Science in Agriculture	2004 - 2005			2005 - 2006			2006 - 2007			2007 - 2008			2008 - 2009		
	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total
Employed Full-Time	18	7	25	3	4	7	5	2	7	5	2	7	12	7	19
Employed Part-Time	2	0	2	1	0	1	0	0	0	0	0	0	1	1	2
Graduate School	0	2	2	0	1	1	1	0	1	1	0	1	0	0	0
Seeking Employment	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0
Not Seeking Employment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No Response to Questionnaire	1	5	6	21	16	37	11	7	18	11	7	18	7	6	13
Total	21	14	35	25	21	46	18	9	27	18	9	27	20	14	34
Median Salary	\$40,000			\$47,000			\$58,000			\$51,000			NOT CALCULATED		

Source: Graduate Status Reports 2004–2009, Cal Poly Career Services

### Financial Support of CAFES Graduate Students

Cal Poly master's degree candidates receive financial aid from a variety of sources. Through our survey of graduate students and inquiry of faculty we have tried to assess the types and amounts of financial support garnered by our graduate students. The results are incomplete and warrant a more consistent method for tracking this support. An alumni survey (1994-2003) taken during our last CAFES Academic Program Review revealed that 32% of respondents had received a research assistantship, teaching appointment, scholarship, or other paid work during their M.S. studies (Shelton et al., 2006). This figure may be higher for the last 5 year cohort, as CAFES external research funding, a primary source of graduate student funding, averaged \$6.4M/year compared to \$4.2M/year during 1994-2003. The results of the current graduate student survey confirm an increase of graduate financial support in the form of research assistantships, scholarships and /or tuition assistance. Details of the various forms of graduate student financial aid and research/teaching assistant support for the last 5 years are provided in Tables 3a and 3b. Unfortunately, due to the Cal Poly Financial Aid Office administrative computing system change in fall 2006 we are not able to compile similar historical financial aid data prior to 2007.

**Table 3a – State\* Financial Aid Received by CAFES Graduate Students 2007–2009**

\*Does not include research grant-funded support via Cal Poly Corporation

FINANCIAL AID SOURCES	2007	2008	2009
# Assistantship Awards (Hull Endowment)	6	5	7
Total \$ Assistantships Awarded (Hull Endowment)	\$12,000	\$10,000	\$12,666
# Work Study Awards	2	3	3
Total \$ Work Study Awarded	\$3,600	\$6,000	\$8,800
# Grant Awards (State University Grants)	56	55	68
Total \$ Grants Awarded (State University Grants)	\$136,480	\$130,679	\$175,665
# Loan Awards	118	110	133
Total \$ Loans Awarded	\$663,663	\$579,237	\$800,473
# Scholarship Awards	61	67	69
Total \$ Scholarships Awarded	\$100,787	\$139,889	\$213,612
# Individual Aid Recipients	95	92	105
TOTAL # AWARDS DISBURSED	243	240	280
TOTAL \$ AMOUNT AWARDS DISBURSED	\$916,530	\$865,805	\$1,211,216

Source: Cal Poly Financial Aid Office

**Table 3b – CAFES Graduate Employment Financial Support 2005–2010**

+Year to date

	2005-06	2006-07	2007-08	2008-09	2009-10+
Total Graduate Student Hourly Pay	N/A	\$257,434	\$237,329	\$406,181	\$395,930
Number of Students	N/A	37	38	56	47
Average Pay per Student	N/A	\$6,958	\$6,245	\$7,253	\$8,424
Number of Projects	N/A	52	47	52	50
Total Graduate Assistantship (stipend) Pay	\$185,611	\$36,881	\$62,913	\$19,617	\$19,617
Number of Students	20	4	6	2	2
Average Pay per Student	\$9,281	\$9,220	\$10,486	\$9,809	\$9,809
Total Teaching Assistantship Pay	\$31,745	\$31,102	\$8,364	\$22,812	\$51,180
Number of Students	11	4	4	4	8
Average Pay per Student	\$2,886	\$7,776	\$2,091	\$5,703	\$6,398
<i>Revised January 2011 to reflect fiscal years and include 2009-10 final data</i>					

Source: Cal Poly Sponsored Programs Office, State Payroll &amp; CAFES Grants Analyst

The sources of funding represented in Table 3b are faculty research grants and departmental funds such as discretionary funding and College-Based Fees. The data show an increase in use of hourly pay as compared to monthly stipends to support graduate students. This is simply an easier method for students and faculty mentors to use for pay purposes.

Two endowments have been established to support CAFES M.S. students through research assistantships. The Dorothy Hull Endowment provides annual awards of \$2,000 for up to 10 CAFES master's degree students conducting their thesis research. Since 2001, the McOmie Endowment has funded a graduate education fellowship, of \$12,000 per year for two years of

master's degree work, followed by four years of doctoral degree support for students continuing on to Ph.D. studies in agriculture and environmental sciences at the University of California, Davis. This 6-year fellowship commitment is made to one or two students each year, with faculty from both Cal Poly and U.C. Davis cooperating on the thesis committees for each degree. To date, one former Cal Poly M.S. student has completed McOmie-funded doctoral studies at U.C. Davis, while three current McOmie fellows are working on their M.S. studies at Cal Poly.

The [Office of Research and Graduate Programs](#) annually coordinates three financial resources to support Cal Poly graduate students from diverse backgrounds. CAFES faculty routinely submit requests for [Non-Resident Tuition Waivers](#) on behalf of highly qualified graduate applicants from outside the State of California. The [Graduate Equity Fellowship Program](#) calls for applications annually from economically disadvantaged graduate students; specifically from underrepresented groups among graduate degree recipients in their areas of study. The [California Predoctoral Program](#) is designed to increase the diversity of California State University students planning to continue their studies at the doctoral level and gain eligibility for faculty positions.

### **Progress to Degree**

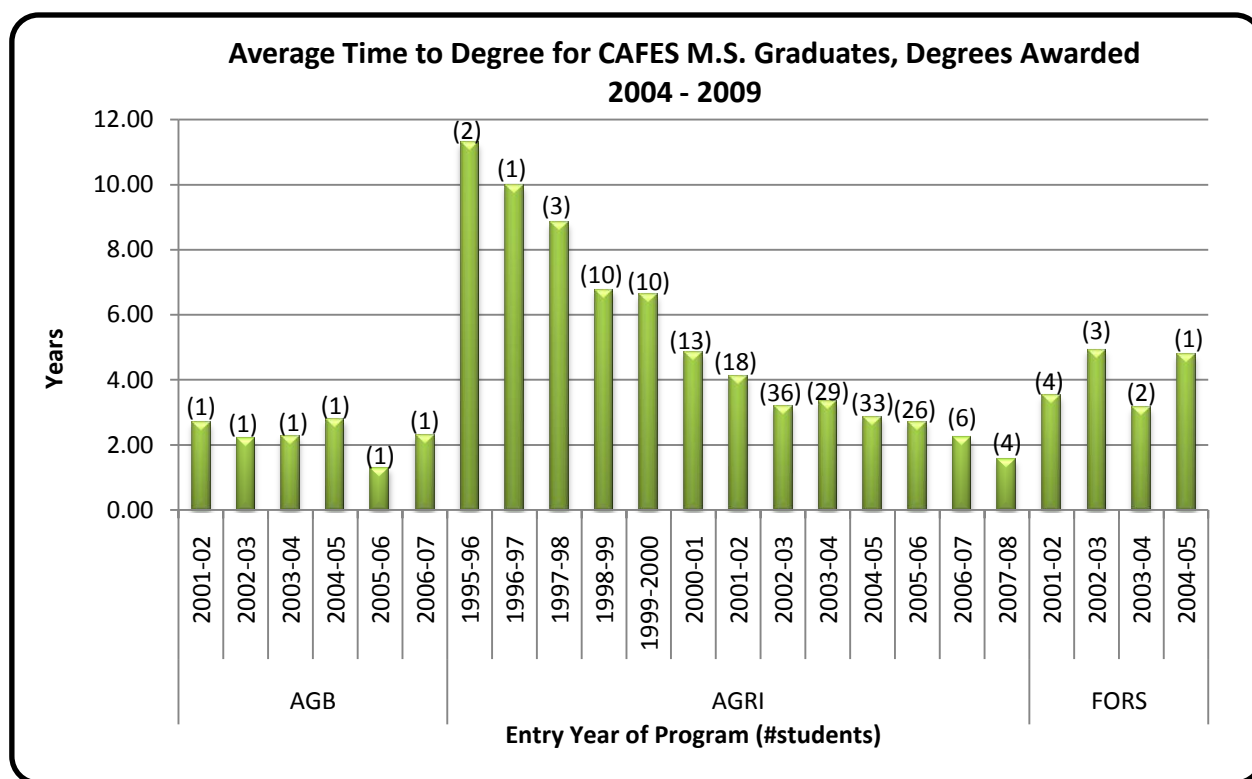
An average of 42 master's degree candidates completed all degree requirements each academic year of this program review cycle (2004-2009). We routinely do the following to encourage timely progress to degree:

- Run a quarterly database file review for *Committee Form* and *Formal Study Plan* forms
- Review all candidates for academic probation/disqualification
- Run quarterly database file check on all candidates for progress to degree
- Host quarterly orientation sessions (pizza lunches) for new graduate students
- Offer 3-week 'late Spring quarter' courses for Master's of Ag Education candidates
- Provide candidates the *Thesis Defense Checklist* (Appendix B) in their final academic term

A very small percentage (estimate <1%) of our M.S. candidates fail to complete their degrees within the allotted 7 year timeframe due to academic disqualification. Based on anecdotal evidence, more common reasons for failure to complete the degree are that candidates: 1) secure a job; 2) lose interest in their studies; 3) undergo significant changes in their personal lives, or a combination of these. Some master's degree candidates have mentioned that part-time jobs or internships taken during their graduate studies have led to career opportunities "they couldn't pass up". While this is disappointing to the Graduate Coordinator on one level, it is gratifying on another.

While data on graduate student degree progress are limited, the [Council of Graduate Schools](#) reported master's degree completion rates of 61% for 12, 500 U.S. Master's degree students between 1993 and 2003 ([Master's Degree Persistence and Attainment-1993 to 2003](#), April 2007). These students averaged 2.7 years to completion of their degrees. Our analysis of 207 CAFES Master's Degrees Awarded during this review cycle (College Years 2004-2009) revealed an average of 2.3 years to degree completion for M.S. Agribusiness students, 4.0 years to degree completion for M.S. Forestry Sciences students, and 3.8 years to degree completion for M.S. Agriculture students; the combined average is 3.8 years to completion of all CAFES M.S.

degrees. This relatively long time to degree completion is strongly influenced by the large percentage of CAFES M.S. candidates in the Agricultural Education Specialization, who generally work full-time while pursuing their graduate degree. A few thesis-based M.S. candidates (e.g. starting in 1995-96 through 1997-98) took educational leaves of absence, which significantly delayed their degree progress. We will evaluate the reasons for longer time to degree completion for other M.S. Agriculture and M.S. Forestry Sciences candidates to determine how best to facilitate faster degree completion. Figure 5 below demonstrates the average time to degree based on entry year into the program.



**Figure 5 – CAFES Average Time to Degree**

### Cal Poly Outstanding Graduate Student Awards

Cal Poly has held an annual competition for the university's outstanding master's degree student and thesis since 1994. CAFES award winners during the 2004-2009 program review cycle are listed in Table 4 below.

**Table 4 – CAFES Winners of Cal Poly Outstanding Graduate Student Awards**

Year	Student	Award
2004 – 2005	Kristen Buckshi	Outstanding Graduate Student
2005 – 2006	W. Hunter Francis	Outstanding Thesis
2006 – 2007	Danielle Bachiero	Outstanding Thesis
	Myles Davis	Outstanding Graduate Student
2007 – 2008	N/A	N/A
2008 – 2009	Thomas Mehlitz	Outstanding Graduate Student

## Assessment of CAFES Graduate Program Learning Outcomes

### Program Goal

The CAFES graduate program goal is to prepare agricultural and natural resources master's degree graduates to be effective professionals and leaders.

### Student Learning Outcomes

In response to the Western Association of Schools and Colleges' (WASC) review of Cal Poly academic programs in 2000, as well as campus and Chancellor's office initiatives, each college was asked to develop a specific assessment plan, focused on student learning outcomes. The CAFES management staff (deans, department heads/chairs) conferred with faculty to develop an assessment plan including eight learning outcomes considered central to all CAFES programs. In 2008, as part of a College Visioning process, we revised our Mission and Vision statements and developed the list of student Learning Outcomes below. Our CAFES Learning Outcomes tie closely to the [University Learning Objectives](#) approved in January 2007. We selected two of these learning outcomes (in boldface), with slight modification, to assess in this M.S. program review.

Learning Outcomes – All students who complete a program in CAFES should be able to:

- **Demonstrate expertise and the use of technology in their respective discipline**
- Demonstrate effective oral and written communication skills
- Make choices based on an understanding of personal and professional ethics and respect for diversity of people and ideas
- Recognize leadership principles and skills
- **Evaluate and solve problems using critical thinking**
- Demonstrate an appreciation for sustainability and global perspectives

### Indirect Assessment Measure of Learning Outcomes

#### *M.S. Agriculture, Ag Education Specialization - Employer Survey*

### Program Background

The Master of Science in Agriculture program has a non-thesis option for those specializing in Agricultural Education. Almost half (49%) of the M.S. degrees awarded 2004-2009 are for this degree program (Appendix C). This program offers opportunities for career advancement for practitioners employed primarily in public educational institutions in the State of California. Students complete a student teaching curriculum as well as an independent, creative project, usually addressing curriculum development, a school facilities project, or a CATA/CDE standard. The major goals of this graduate program are to: 1) prepare educators with advanced strategies relative to pedagogy, and 2) ensure that agricultural educators are meeting the learning outcomes and standards developed by the California Agricultural Teachers' Association (CATA). These learning outcomes and standards were adopted by the California Department of Education (CDE) and are routinely verified by CDE consultants and regional supervisors.

On-site visitations by CDE personnel provide one avenue for assessing the quality of our graduates. However, many educational institutions have multiple teachers who may not have completed the advanced degree at Cal Poly. Verification documents and adherence to quality criteria offer one perspective of a program and the educators directing the program. Another avenue for assessing the quality of our non-thesis M.S. in Agriculture program is to go directly to the employers and ask for their feedback. This was our approach in the employer survey.

### Survey Objectives

Our survey addressed the following objectives:

1. **Cal Poly and CATA/CDE Learning Outcomes** – Measure skill attainment related to student learning outcomes centered on teaching and instruction.
2. **Other Standards (CATA/CDE)** – Measure the overall quality of graduates, teaching readiness, workplace readiness, leadership skills, advisory committee representation, and life-long learning.
3. **Personal Qualities** – Measure the personal qualities employers value most when hiring new M.S. teaching graduates.
4. **Salary Information** – Determine the average starting salary and salary differential for M.S. degree holders.

### Survey Methods

A survey instrument (Appendix D) was developed by graduate program representatives in consultation with Dr. Wendy Warner, Agricultural Education & Communication faculty and Mr. Martin Shibata, Director of Career Services. The survey was designed to assess the degree to which CAFES Agricultural Education master's degree alumni from 2000-2009 had attained key learning outcomes, as viewed by their employers. An Output Request was submitted to the Cal Poly Advancement Office in May 2009 for a list of 2000-2009 Alumni with Master's Degree in Agribusiness, Agriculture or Forestry Sciences. The list of 317 names was sorted by program and specialization resulting in a total of 153 Agricultural Education and General Agriculture alumni names, which were sent to the Agricultural Education and Communication Department to provide the employer (school district) contact information, specifically email addresses. Career Services sent the first batch of surveys to 84 contacts on October 26, 2009 and the second batch of surveys was sent to 17 contacts on November 4, 2009; a total of 101 surveys were distributed. Follow-up phone calls and emails were made to increase response rates. Completed surveys were received and results were compiled by Career Services at the end of Fall 2009 Quarter.

The survey questions incorporated key learning outcomes, which are slightly modified from both the University Learning Objectives and CAFES Learning Outcomes:

- Cal Poly/CAFES Learning Outcome 1: *Demonstrate subject matter expertise and effective pedagogy required in an Agricultural Education Program*
- Cal Poly/CAFES Learning Outcome 2: *Evaluate and solve problems using critical thinking*

Additional CATA/CDE *learning outcomes* assessed in our employer survey are as follows:

**Subject Curriculum** - Know and understand the subject curriculum at grade levels

**Lesson Plan Preparation** - Able to prepare lesson plans and students for class activities

**Teaching Mix** - Use an effective mix of teaching strategies and instructional activities'

**Teach Agriculture and Natural Resources** - Prepared to teach agriculture and natural resources according to California Content Standards

**Teach Science** - Prepared to teach science according to California Content Standards

**Diverse Cultures** - Demonstrate an understanding and appreciation of students from diverse cultural backgrounds

**English Language Learner (ELL) Needs** - Able to meet the instructional needs of ELL students

**Special Needs** - Able to meet the instructional needs of special need students (i.e. IEP, 504 plan)

**Promote Involvement** - Able to advise FFA activities that promote involvement by all students

**Supervised Agricultural Experience (SAE)** - Assist students in developing and maintaining SAE projects

**Technology** - Able to employ appropriate technology in their instruction of students

**Classroom Management** - Manage a class and use classroom time effectively

**Behavior/ Discipline** - Manage behavior and discipline satisfactorily

**Communication** - Able to communicate effectively with parents or guardians of students

CATA/CDE *Standards* assessed in this study are as follows:

**Overall Quality** - Satisfied with the quality of CAFES M.S. teaching graduates

**Teaching Readiness** - Able to make a positive contribution to the school district with minimal supervision

**Workplace Readiness** - Able to make an immediate contribution to the school district

**Leadership Skills** - Able to assume professional association (e.g. California Agricultural Teachers' Association -CATA, professional organization membership, etc.) participation and responsibilities when expected

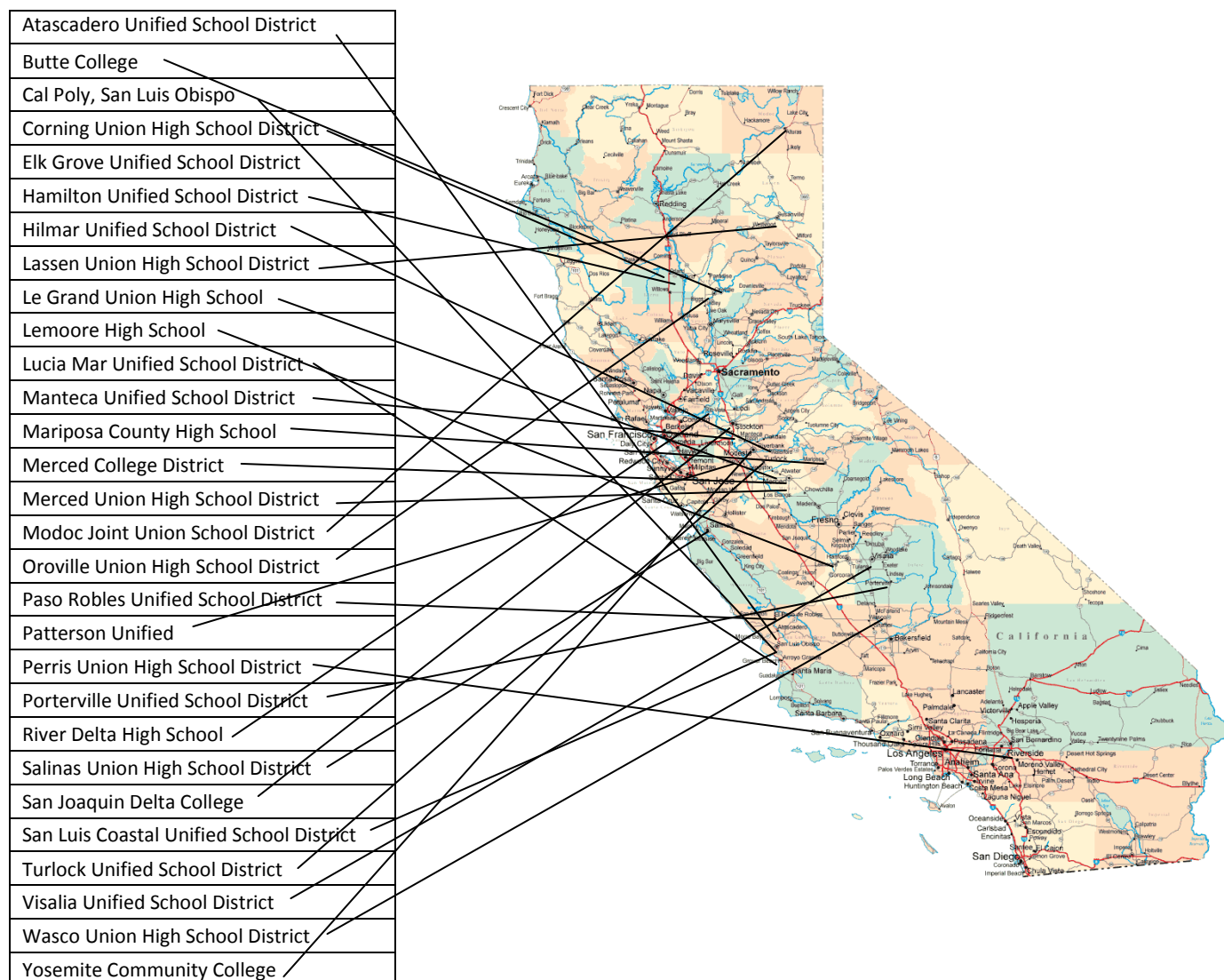
**Advisory Committee** - Effective in organizing and managing an advisory committee and utilizing community support and resources

**Life-Long Learning** - Independently seek opportunity for professional development and apply newly acquired skills/knowledge to the school program

## Survey Results

The surveys were completed by school district personnel including principals, assistant principals, superintendents and others in a position to assess M.S. graduates. Twenty-nine different school districts participated in the survey, resulting in 30 survey responses. Figure 6 shows the school districts from which we received employer responses. The statewide distribution of respondents follows the pattern of employment of program graduates. Central California has a high percentage of programs of instruction in agricultural education, with few graduates employed in the northern and southern regions of the State.





**Figure 6 – California school districts participating in Agriculture Teachers Employer Survey, 2009**

### Learning Outcomes

The results were tabulated based on a five-point Likert Scale. Table 5 displays the responses for the 14 Cal Poly/CATA/CDE learning outcomes in order of mean scores (high to low). The mean scores (highlighted in yellow) indicate that on a 5-point scale (where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree), employers agree that our graduates are achieving the stated learning outcomes. Twelve of the 14 learning outcomes received mean scores above 4.0, while only two outcomes were below 4.00. The results indicate that the respondents (employers) agree that Cal Poly graduates of this non-thesis master's degree program have attained the following learning outcomes: *Promote Involvement, Teach Agriculture and Natural Resources, Subject Curriculum, Technology, Lesson Plan Preparation, Supervised Agricultural Experience, Classroom Management, Teaching Mix, Teach Science, Communication, Behavior/Discipline, and Diverse Cultural Backgrounds.*

The mode (most frequent) response (highlighted in blue) for the learning outcomes shows a slightly different distribution. While 12 of the 14 items are rated as 'Agree' to 'Strongly Agree',



two items that are related in terms of serving special populations are rated as ‘Neutral’ (no agreement or disagreement). This represents a concern for the program. All California agriculture teachers are required to have instruction in *Special Needs* and *English Language Learner Needs* in their credential programs. However, the M. S. Agriculture program does not require those specializing in Agricultural Education to complete coursework specifically dealing with these two learning outcomes. Therefore, it is incumbent upon the CAFES graduate faculty to integrate instruction for *Special Needs* and *English Language Learners* into their courses.

Four items had employer responses with disagreement to M.S. graduates having met the learning outcomes. In addition, 7 respondents marked ‘Neutral’ in meeting the learning outcome associated with demonstrating an understanding and appreciation of students from diverse cultural backgrounds. These responses, while not positive, are also not negative, and thus it isn’t clear whether a problem exists or the respondents didn’t see the issue as particularly germane to their school situation. Either way, the program may need to focus more instruction in this area to ensure that Cal Poly graduates are prepared to work in diverse school environments.

**Table 5 –Learning outcome attainment of Agriculture Teachers as viewed by employers**

Learning Outcomes	Strongly Disagree	Neutral	Agree	Strongly Agree	Total Responses	Mean
Scale Scores →	1 or 2	3	4	5		
1. Promote Involvement	0	1	4	25	30	4.80
2. Teach Agriculture & Natural Resources	0	2	8	20	30	4.60
3. Subject Curriculum	0	1	11	18	30	4.57
4. Technology	0	2	9	17	28	4.54
5. Lesson Plan Preparation	0	1	12	17	30	4.53
6. Supervised Agricultural Experience	1	4	4	19	28	4.46
7. Classroom Management	1	1	13	14	29	4.38
8. Teaching Mix	0	5	9	16	30	4.37
9. Teach Science	0	3	14	13	30	4.33
10. Communication	0	3	14	13	30	4.33
11. Behavior/Discipline	1	3	12	14	30	4.30
12. Diverse Cultural Backgrounds	0	7	7	14	28	4.25
13. Instruction – Special Needs	0	11	10	8	29	3.90
14. Instruction – English Language Learner Needs	2	11	9	7	29	3.72

### CATA/CDE Standards

The responses for CATA/CDE Standards are shown in Table 6. Agreement was evident in both the mean (yellow highlight) and the mode (blue highlight) for each item. Essentially, the majority of respondents agree that the graduates of this non-thesis program meet the standards of *Teaching Readiness*, *Leadership Skills*, *Overall Quality*, *Workplace Readiness*, *Life-Long Learning*, and *Advisory Committees*. However, it is important to note the number of ‘Neutral’ responses in each category. *Life-Long Learning* and *Advisory Committees* had three ‘Neutral’ responses, or approximately 10% of the employers, neither agreeing nor disagreeing with graduate’s attainment of these standards.

**Table 6 – Other quality standard attainment of Agriculture Teachers as viewed by employers**

CATA/CDE Standards	Strongly Disagree	Neutral	Agree	Strongly Agree	Total Responses	Mean
Scale Scores →	1 or 2	3	4	5		
1. Teaching Readiness	0	1	9	19	29	4.62
2. Leadership Skills	0	1	8	19	28	4.59
3. Overall Quality	0	1	11	18	30	4.57
4. Workplace Readiness	0	1	12	16	29	4.52
5. Life-Long Learning	0	3	9	16	28	4.46
6. Advisory Committee	0	3	11	15	29	4.41

### Personal Qualities

School districts were provided with 20 personal qualities sought in teacher candidates, then were asked to identify their top seven qualities they value most when hiring graduates. Table 7 below shows the frequency of choices among school districts:

**Table 7 – Qualities valued by California public school district administrators in new teachers**

Personal Quality	Frequency
Team Work/Team Player	20
Enthusiasm/Energy	17
Motivation/Drive	17
Attitude	16
Communication Skills	16
Honesty/Integrity	14
Work Collaboratively	14
Work Ethic	14
Commitment	13
Leadership Skills	11
Technical Skills	11
Adaptability	10
Interpersonal/Social Skills	10
Problem Solving Skills	10
Confidence	4
Creative/Innovative	4
Critical Thinking	4
Analytical	2
Independent Worker	2
Public Speaking	1

The employers representing the school districts valued *Teamwork*, *Enthusiasm*, *Motivation*, *Attitude*, *Communication*, *Honesty*, and *Collaboration* as the top seven personal qualities of new teachers. It is interesting to note some of the personal qualities that received low frequency scores. It is highly possible that many of the school districts expect many of the personal qualities to be inherent in one who has completed teacher preparation program. For instance, *Public Speaking*, *Interpersonal Skills*, and *Leadership Skills* were not in the top seven personal

qualities. Since agricultural educators are *expected* to teach leadership as an integral part of the curriculum, it may be “a given” from an employer perspective.

The ratings of the personal qualities offer some insight regarding what school leaders expect of their employees. This information is of importance in selecting candidates for teaching (entrance into the credential program). Many of the qualities in the teaching candidates can be evaluated as a part of the screening for dispositions prior to entering the credential program and/or during the credentialing process. However, many of the candidates seeking a graduate degree are either concurrently enrolled in the credential program or have already fulfilled credentialing requirements. It is in the best interest of our graduate students to understand the personal qualities valued by employers.

### **Salaries**

The school districts identified starting salary information as \$42,827 with a salary differential of \$1,718. It should be noted that this represents the base salary. Many districts provide stipends for various extra duty assignments associated with extended duty and supervision.

### **Key Findings**

The results of our employer survey indicate that M.S. Ag Education graduates are developing the professional attributes and attaining the key learning outcomes and standards established by the University, CAFES, and CATA/CDE. The responses showed strong support that our graduates demonstrated subject matter expertise and effective pedagogy for teaching agricultural education. It is less clear from the survey that our graduates were strong critical thinkers/problem solvers. This may be due to the nature of our survey questions, which perhaps did not focus explicitly enough on this attribute. It is interesting to note that neither problem solving skills nor critical thinking were ranked in the top 10 personal qualities sought by public school administrators in their new hires.

School districts reported that our M.S. graduates possess the industry readiness and leadership skills to be successful. They are effective in organizing and managing instruction, operating advisory committees, applying newly acquired skills, and independently seeking opportunities for professional development. More attention may need to be paid to preparing our graduate students to address special needs students and those from diverse cultural backgrounds.

## ***M.S. Agribusiness, Agriculture & Forestry Sciences Employer Survey***

### **Survey Methods**

A written survey instrument (Appendix E) was developed with was developed by graduate program representatives in consultation with Dr. David Headrick (Horticulture & Crop Science), Dr. Rafael Jimenez-Flores (Dairy Science) and assistance from Mr. Martin Shibata, Director of Cal Poly Career Services to assess the degree to which thesis-based CAFES M.S. program alumni from 2000-2009 had attained key learning outcomes, as viewed by their employers. These learning outcomes were slightly modified from University Learning Objectives and CAFES Learning Outcomes and are as follows:

- Cal Poly/CAFES Learning Outcome 1: *Demonstrate expertise and the use of technology in their respective discipline*
- Cal Poly/CAFES Learning Outcome 2: *Evaluate and solve problems using critical thinking*

An Output Request was submitted to the Cal Poly Advancement Office in May 2009 for a list of 2000-2009 Alumni with Master's Degree in Agribusiness, Agriculture or Forestry Sciences. The list of 317 names was sorted by program and specialization resulting in 164 names of thesis-based alumni; several requests for alumni contact and employer information were sent to CAFES faculty. The first batch of surveys was sent to 4 sources on October 26, 2009 and the second batch of surveys was sent to 5 sources on November 2, 2009 by Career Services, totaling 9 surveys distributed. Follow-up emails and internet research were made to increase the number of employer sources of thesis-based CAFES M.S. program alumni. At the time of writing this self study, too few responses from employers were obtained to draw meaningful conclusions.

### *Survey of Current CAFES M.S. Students*

#### **Survey Methods**

A survey instrument (Appendix F) for current CAFES graduate students was developed with input from the CAFES Graduate Studies and Research Committee and Mr. Martin Shibata to assess students' perceptions of program strengths and weaknesses, and to determine the degree to which M.S. candidates deem they are achieving key learning outcomes. These learning outcomes were slightly modified from ULOs and CAFES Learning Outcomes as follows:

- All students: To what extent is your graduate program as a whole preparing you to evaluate and solve problems using critical thinking?
- Thesis-based students: To what extent is your graduate program as a whole preparing you to demonstrate expertise and the use of technology in your respective discipline?
- Ag Education students: To what extent is your graduate program as a whole preparing you to demonstrate subject matter expertise and effective pedagogy required in an Agricultural Education career?

This survey was electronically administered via [Zoomerang<sup>®</sup>](#). A query of the CAFES Graduate Programs database provided a list of current (those within the 7-year time limit as of Fall 2009 quarter) graduate student email addresses. The survey was first launched to 352 email addresses on May 20, 2010; a second request to complete the electronic survey was sent June 7, 2010 to the email addresses of students who did not complete the survey. Survey responses were compiled by [Zoomerang<sup>®</sup>](#) and further analyzed by the CAFES Graduate Program Assistant.

#### **Survey Results**

Within one week of deploying the survey, 55 current students completed the survey while 22 more students responded to the second request, resulting in a total of 77 completed surveys; a 22% response rate. Below is the frequency of survey responses.

## Frequency of Survey Responses

1. Average Age **30 years**
2. Gender **62%**Female & **38%**Male
3. What is your M.S. Degree program? **19%**M.S. Agribusiness **12%**M.S. Forestry Sciences  
**69%**M.S. Agriculture
4. If M.S. Agriculture, select Specialization: **18%**AgEd **4%**AET **20%**AnSci **4%**CrpSci **7%**DPT  
**4%**EnvHortSci **16%**FSN **3%**GenAg **0%**Irrig **4%**PlantProtec **4%**RecPrks **16%**SoilSci
5. What phase of the program are you in? **16%**1<sup>st</sup> year **19%**2<sup>nd</sup> year **56%**Completed coursework  
**9%**Other= Completed / Did Not Complete / Leave of Absence
6. Thesis students: In what phase of your thesis-work are you? (Check all that apply)  
**18%**Selected Topic **22%**Conducting Literature Review **32%**Conducting Research  
**44%**Writing Thesis **19%**Other= Completed / Deciding on topic / Discontinued
7. What forms of financial aid/paid work have you received as a graduate student? (Check all that apply)  
**36%**Research Assistant **24%**Teaching Assistant **3%**Lecturer **33%**Scholarship  
**29%**Tuition Assistance **18%**Not Applicable **25%**Other= Employer / Grants / Loans / None
8. To what extent are space/facilities/equipment (e.g. offices, outdoor labs, computing, etc.) available to support your Master's degree work?  
**10%**Not at all **22%**Minimal **22%**Neutral **28%**Significantly **18%**All needs met
9. Are there an adequate number of graduate-level (400- & 500- ) courses offered to support your M.S. degree? **57%**Yes **43%**No **NOTE: 28 comments – See Appendix G**
10. To what extent is your graduate program as a whole preparing you to evaluate and solve problems using critical thinking?  
**1%**Not at all **3%**Minimal **21%**Neutral **59%**Significantly **16%**All needs met
11. Thesis-based students: To what extent is your graduate program as a whole preparing you to demonstrate expertise and the use of technology in your respective discipline?  
**3%**Not at all **3%**Minimal **27%**Neutral **46%**Significantly **21%**All needs met
12. Ag Education students: To what extent is your graduate program as a whole preparing you to demonstrate subject matter expertise and effective pedagogy required in an Agricultural Education career?  
**0%**Not at all **14%**Minimal **7%**Neutral **58%**Significantly **21%**All needs met
13. How often do you meet with your Graduate Committee Chair (AKA major professor)?  
**59%**Frequently **17%**Quarterly **11%**Annually **13%**Other= Irregularly / None
14. Have you met with your Graduate Committee Chair to discuss: (Check all that apply)  
**39%**Career advice **68%**Coursework advice **77%**Complete Graduate forms **69%**Research advice  
**57%**Thesis writing

15. Why did you enroll in this graduate program? (Check all that apply) **75%**Career advancement **21%**Career change **48%**Intellectual Curiosity **8%**Other \_\_\_\_\_
16. At this point, are your expectations of your graduate program being met? **4%**Not at all **17%**Minimal **34%**Neutral **33%**Significantly **12%**All needs met
17. What aspects of the CAFES Graduate Program are most frustrating for you? **63 responses - See Appendix G**
18. What aspects of the CAFES Graduate Program are most positive for you? **62 responses - See Appendix G**

### Learning Objectives

A majority (59%) of the survey respondents reported the extent to which their graduate program is preparing them to evaluate and solve problems using critical thinking as ‘Significantly’; however, more respondents selected ‘Neutral’ as compared with ‘All needs met’ for this learning objective. Almost half (46%) of the thesis-based respondents indicated the extent to which their graduate program is preparing them to demonstrate expertise and the use of technology in their respective discipline as ‘Significantly’, while more students selected the ‘Neutral’ response than those who felt ‘All needs met’ for this learning objective. Agricultural Education students expressed considerable satisfaction (58% ‘Significantly’ & 21% ‘All needs met’) with the extent to which their graduate program is preparing them to demonstrate subject matter expertise and effective pedagogy required in an Agricultural Education career. On the contrary, more students selected ‘Minimal’ as compared with the number of ‘Neutral’ responses received for this learning objective; to this program’s credit, none of the respondents selected the ‘Not at all’ response for this learning objective. Overall, a majority of our current CAFES graduate students believe their program is preparing them to achieve the two learning objectives assessed in this M.S. program review.

### Other Key Findings

In addition to the assessment of learning objectives, another goal of the current CAFES M.S. student survey is to gauge students’ perceptions of the graduate program’s strengths and weaknesses. Responses to the ‘space/facilities/equipment available to support your M.S. work’ are almost evenly distributed amongst the ‘Minimal’ (22%), ‘Neutral’ (22%), ‘Significantly’ (28%), and ‘All needs met’ (18%) categories. While more students agreed there is an adequate number of graduate-level courses offered to support their M.S. degree (57% Yes and 43% No), their written comments (Appendix G) revealed dissatisfaction with the variety and frequency of CAFES 500-level courses offered. A majority of survey respondents reported regular meetings with their Graduate Committee Chair, 59% frequently and 17% quarterly; the primary reason for meeting with their Committee Chair is to ‘Complete Graduate forms’. The extent to which our current graduate students deem their expectations are being met is a bell-shaped distribution; the ‘Neutral’ responses (34%) are slightly more than the ‘Significantly’ (33%) responses however, the ‘Minimal’ responses (17%) are slightly more than the ‘All needs met’ (12%) responses. Students were also encouraged to provide optional written feedback on the aspects of the CAFES Graduate Program which are most frustrating and most positive. These anonymous comments, along with the summary of survey results will be shared with all CAFES Graduate Coordinators and the CAFES Graduate Studies and Research Committee for further discussion.

The major written criticisms of our graduate program seem to focus on the lack of graduate-level coursework, financial and time support from faculty mentors, and the lack of expected “benefits” for graduate students, such as dedicated office space, graduate student housing, and other amenities, distinct from the undergraduate program . The common theme of many students’ complaints was that Cal Poly gives most of its attention to undergraduates, with graduate students either invisible or at best, second class.

### ***Faculty Focus Groups***

Two CAFES faculty focus groups were held to discuss graduate program strengths and weaknesses as viewed by junior and senior tenure track faculty, respectively. Key comments were recorded and summarized in Table 8 below.

**Table 8 - Summary comments by CAFES faculty focus groups**

<b>Comment</b>	<b>Junior Faculty</b>	<b>Senior Faculty</b>
Department has a strong interest in graduate programs; department and/or individual faculty rely on graduate students to support the teacher-scholar model and assist with research projects.		X
Critical Mass: don’t have enough graduate students to offer graduate-level courses.		X
Lack of funding to support graduate students, not enough release-time for faculty, need more research lab & office space, Overall lack of resources makes it difficult to recruit top graduate students.	X	X
Research does not appear to be a priority for some departments	X	
Encountered issues with hiring graduate students as Teaching Assistants, which would support the Teacher-Scholar model	X	
To establish a strong graduate program we need to encourage networking amongst departments/programs to share resources, graduate students, teach graduate-level courses, etc. Have to be more strategic and change culture.	X	X

Some faculty felt strongly that establishment of a Graduate Faculty in CAFES is essential to strengthen and grow our graduate program. Anticipated benefits of this faculty designation, common at many universities, include: 1) recognition of faculty committed to the teacher-scholar model and graduate education; 2) easier cooperation among those faculty interested in mentoring graduate students, sharing labs and other resources, and team teaching at the graduate level; 3) improving success in obtaining extramural funding for research support by joint submission of proposals; and 4) reducing the isolation felt by many faculty involved in scholarship and graduate student mentoring. If we pursue this, we will have to be careful not to disenfranchise faculty not chosen for this distinction.

A common theme in both focus group discussions is that of establishing a *culture* of graduate studies at Cal Poly. This is seen as critical for retention of newer faculty, attracting new hires, and raising the intellectual climate on campus.

### **Direct Assessment Measure of Learning Outcomes – M.S. Thesis Review**

A key feature of graduate education is the independent scholarship and creative activity expected of the student. An individual, culminating experience is required of each master's degree candidate, and may take one of three forms, according to Title V of the California Code of Regulations:

***Title V, Section 7, Article 40510. (3) Satisfactory completion of a thesis, project, or comprehensive examination, defined as follows:***

*(A) A thesis is the written product of a systematic study of a significant problem. It identifies the problem, states the major assumptions, explains the significance of the undertaking, sets forth the sources for and methods of gathering information, analyzes the data, and offers a conclusion or recommendation. The finished product evidences originality, critical and independent thinking, appropriate organization and format, and thorough documentation. Normally, an oral defense of thesis is required.*

*(B) A project is a significant undertaking appropriate to the fine and applied arts or to professional fields. It evidences originality and independent thinking, appropriate form and organization, and a rationale. It is described and summarized in a written report that includes the project's significance, objectives, methodology, and a conclusion or recommendation. An oral defense of the project may be required.*

*(C) A comprehensive examination is the assessment of the student's ability to integrate the knowledge of the area, show critical and independent thinking, and demonstrate mastery of the subject matter. The results of the examination evidence independent thinking, appropriate organization, critical analysis and accuracy of documentation. A record of the examination questions and responses shall be maintained in accordance with the record retentions policy of The California State University.*

Cal Poly's requirements for culminating experiences are consistent with Title V. The CAFES Graduate Programs requires the Oral Comprehensive Exam of *all* M.S. candidates, normally taken in the final quarter of their program, in addition to a thesis or written project (Agricultural Education specialization). A Written Comprehensive Exam is optional upon the recommendation of the graduate student's committee.

### **Thesis Review Process**

A graduate student's original work on and subsequent defense of his or her thesis is critical to the decision of whether or not to award the M.S. degree to the candidate. For most graduate students, the thesis is the most significant scholarly work of their graduate career to date, so it is appropriate that we evaluate the quality of a random sample of CAFES M.S. theses.

A committee of three persons was formed to review representative M.S. theses of the College of Agriculture, Food and Environmental Sciences. Members were:

- Dr. Charles Burt, BioResource & Agricultural Engineering Dept.
- Dr. Richard Thompson, Natural Resources Management Dept.
- Dr. Jeffrey Wong, Horticulture & Crop Science Dept.



Ten CAFES M.S. theses were selected from the list of *CAFES Completed MS Thesis Titles 2004–2009* (Appendix H), using a stratified random sample of two theses from each year.

A scoring rubric for M.S. thesis quality was developed in 2005 by a faculty thesis review committee (Drs. Burt, Thompson, and Thomas Ruehr) with input from the Program Representatives, Dean of Research & Graduate Programs, and Vice Provost for Undergraduate Education (David Conn). This rubric was used in our first CAFES M.S. Academic Program Review and has been used again for this review (Table 9a). Each committee member read and independently rated the individual theses, using the scoring rubric with criteria as defined below. Note: thesis reviewers generated their rubric scores after checking, but not numerically scoring, each learning outcome. Their rubric scores for each thesis represent a single numerical value, rather than an average (Table 9b).

**Table 9a – Rubric for CAFES M.S. Thesis Review**

1) For each thesis project, make an "x" under each "Learning Outcome" that are met 2) Assign a "Rubric Score", based on the specified interpretation, in the box for each name.											
<b>Learning Outcome ↓</b>	<b>Thesis Author →</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>
Demonstrated original thinking or creativity											
Clear identification of relevant problem or question											
Literature review is related to the context of the problem											
Formulates an original hypothesis											
Uses appropriate research methods and/or technologies											
Shows evidence of advanced technical achievement											
Analyzes findings in adequate depth											
Draws appropriate, reasoned conclusions from the findings											
Reports findings clearly with writing competency and good organization											
<b>Rubric Score</b> (If score = 0, note as NE, IR or NS)											
<b>Interpretation for determining Rubric Score:</b>											
<b>4</b>	Fully demonstrates all expected learning outcomes for this educational objective (goal) at an exemplary level										
<b>3</b>	Substantially demonstrates learning outcomes for this educational objective (goal), although one or more learning outcome(s) is evidenced in a limited, though adequate way										
<b>2</b>	Demonstrates most learning outcomes for this educational objective (goal) at an adequate level, with serious lack of evidence for one or more outcome										
<b>1</b>	Minimally achieves this educational objective, with very limited evidence of expected learning outcomes										
<b>0</b>	Fails to demonstrate evidence for this educational objective. If score is "0" indicate whether it is based on NE or IR or NS, where: NE = No evidence is offered IR = All proposed evidence is irrelevant to this objective NS = Relative evidence suggests the objective is clearly not met										

**Table 9b – Individual and Average Rubric Scores for M.S. Theses**

<b>Thesis Author →</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>
Evaluator #1	4	3	4	4	4	2	3	4	4	3.5
Evaluator #2	4	3	3	4	NE	NE	3	4	4	NE
Evaluator #3	4	3	4	4	4	3	3	4	4	3
<b>Average Rubric Score</b>	<b>4</b>	<b>3</b>	<b>3.67</b>	<b>4</b>	<b>2.67</b>	<b>1.67</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>2.17</b>

***Comments of Richard Thompson, Chair, M.S. Thesis Review Committee***

As part of the 2010 program review of CAFES masters programs, a committee of three CAFES faculty was asked to evaluate 10 randomly selected master's theses using a rubric provided by the Dean's office. The grading rubric contained 9 learning outcomes. Each evaluator was to score each thesis on how well each outcome was met. The possible rubric scores ranged from 0 to 4. The 10 theses fairly represented the diversity of academic disciplines in the college, ranging from the social sciences to the bio-physical sciences. The theses were evaluated independently and the scores were compiled by the Dean's office. The results showed close agreement on all sample theses except three. The majority fully or substantially demonstrated achievement of the learning outcomes. The three evaluators met to discuss the three theses where scores were not consistent, and arrived at a consensus on the following two points.

- The College Graduate Studies & Research Committee in concert with the Dean's office should clarify and communicate to all faculty involved in graduate studies some basic standards for a master's thesis in science. All M.S. theses should clearly demonstrate the student's ability to employ the scientific method, to include all of the following components:
  1. An explicit statement of a testable hypothesis/question
  2. Adherence to a scientifically supported method that is repeatable.
  3. Analysis of quantitative results.
  4. Literature search.
  5. Conclusions that are developed in a manner that, given the same data, others would arrive at the same conclusions.

Two of the sample theses employed a qualitative method generating questionable results on the grounds of repeatability. Such methods are better suited for a Master of Arts thesis. The third thesis in question was more like a project than a thesis.

- It is clear that different departments and major professors have access to different levels of funding to support thesis projects. Therefore, we feel that clarification of and adherence to, the rules regarding process and components are more important than requiring students to develop peer-review level, publishable theses.

## **Alignment of University Learning Objectives with Program Curricula**

The College of Agriculture, Food and Environmental Sciences is committed to preparing our students to be successful in a complex, ever-changing environment for agriculture, natural resources, and applied life sciences. One key to providing appropriate curriculum and fostering student learning outcomes is to periodically assess our programs and use the results to improve the Cal Poly College of Agriculture, Food and Environmental Sciences experience.

Our 2008-09 WASC Assessment Inventory report for CAFES Graduate Programs (Appendix I) showed progress in development of University, CAFES and program learning objectives across our M.S. curricula, though more work clearly remains. The small numbers of graduate students in some CAFES M.S. programs have led to less attention being paid to their curricula than in larger programs. This issue surfaces not only with respect to learning outcomes but also in new course development, and other program improvements.

### **M.S. Curricular Mapping of University Learning Objectives**

This is our first attempt to directly link development of University Learning Objectives (ULOs) to specific M.S. course curricula, thus our results provide a baseline for future comparison. In order to measure how our M.S. curricula address ULOs, departmental coordinators for our M.S. Agriculture, Animal Science Specialization, M.S. Agribusiness, and M.S. Forestry Sciences programs completed tables tracking development of ULOs to their respective M.S. curricula (see below). These curricula were chosen as representative of our CAFES M.S. curricula for purposes of this self study. Though ULOs are not well developed for all courses in the three M.S. curricula reviewed here, progress is being made.

**Table 10a – Sample Map of a Typical M.S. in Agriculture, Animal Science Specialization Study Plan Aligned with the University Learning Objectives**

University Learning Objectives - All students who complete a M.S. in Agriculture, Animal Science Specialization at Cal Poly should be able to:												
KEY: I=Introduced to , D=Develop , M=Master									Make reasoned decisions based on:			
Green = Required Courses Blue = Select From List Yellow = Approved Electives <b>COURSES ↓</b>	Think critically	Think creatively	Communicate effectively	Expertise in scholarly discipline	Understand discipline in larger world	Individual work	Group work	Use knowledge & skills to make a positive contribution	Engage in lifelong learning	an understanding of ethics	a respect for diversity	an awareness of sustainability
ASCI 581 Grad Seminar (3)	M	M	M	M	M				M	D		
AG 581 Grad Seminar (1)												
AG 599 Thesis (6)	M	M	M	M	M	M			M			
STAT 512 Stat Methods (4)	D		D	D								
STAT 513 Exp Design (4)	M	D	M	M	M		M			D		
Select 16 units from the following:												
AG 500 Individual Study (6)												
ASCI 403 Applied Biotech (5)	D	D	D	D	D	D	D	D	D			
ASCI 405 Domestic Livestock (4)	M		D	D	D	D	D					
ASCI 406 Animal Embryology (5)				D	I	D						
ASCI 415 HACCP Meat & Poultry (3)												
ASCI 420 Animal Metabolism (3)	M		D	D	D	M						
ASCI 450 Computer Apps (4)												
ASCI 500 Individual Study (6)												
ASCI 503 Adv Molecular Tech (4)	M	M	M	M	D	M	M		D			
VS/ASCI 438 Sys Animal Phys (4)	D		D	M	D	D	D		D	D		
VS/ASCI 440 Immunology (4) OR	M	M	M	D	D	D						
VS/ASCI 540 Adv Immunology (4)												
AGED 438 Instruct Processes (4)												
BIO 501 Molec & Cell Biology (4)	M	M	M	M	D	M	M					
BIO 524 Developmental Bio (2)												
CHEM 528 Nutritional Biochem (3)												
NR 532 Apps in Biometrics (4)		D		D		D			D			
RESTRICTED ELECTIVES (11)												

**Table 10b – Sample Map of a Typical M.S. in Agribusiness Study Plan Aligned with the University Learning Objectives**

University Learning Objectives - All students who complete a M.S. in Agribusiness at Cal Poly should be able to:												
KEY: I=Introduced to , D=Develop , M=Master										Make reasoned decisions based on:		
Green = Core Courses Yellow = Approved Electives <b>COURSES ↓</b>	Think critically	Think creatively	Communicate effectively	Expertise in scholarly discipline	Understand discipline in larger world	Individual work	Group work	Use knowledge & skills to make a positive contribution	Engage in lifelong learning	an understanding of ethics	a respect for diversity	an awareness of sustainability
AGB 422 OR 433 OR 435 (4)	D	I	D	I	D		D	I				I
AG 450 Ag Strategy (4)	I	D	D		I		I		I		D	
AGB 514 AGB Managerial (4)			D		D		M		D	D	D	
AGB 543 Ag Policy (4)	M			D	D	D		D	D	D	I	M
AGB 554 Food Sys Marketing (4)		D	D	D								
AGB 555 Tech & Economic Change (4)	M	M	M	D	M	D			D	D	M	M
AGB 563 Int'l AGB Trade (4)		D		D	M		D	I	D		M	M
AGB 599 Thesis (6)	D	D	D		M	M		I	D			
AG 460 Research Method (2) OR SS 501 Research Planning (4)	M	D	M			M		D				
NR 532 Apps in Biometrics (4)		D		D		D			I			
APPROVED ELECTIVES (7-8)												

**Table 10c – Sample Map of a Typical M.S. in Forestry Sciences Study Plan Aligned with the University Learning Objectives**

University Learning Objectives - All students who complete a M.S. in Forestry Sciences at Cal Poly should be able to:												
KEY: I=Introduced to , D=Develop , M=Master										Make reasoned decisions based on:		
Green = Required Courses Yellow = Approved Electives <b>COURSES ↓</b>	Think critically	Think creatively	Communicate effectively	Expertise in scholarly discipline	Understand discipline in larger world	Individual work	Group work	Use knowledge & skills to make a positive contribution	Engage in lifelong learning	an understanding of ethics	a respect for diversity	an awareness of sustainability
NR 532 Apps in Biometrics (4)	M	M	D	M	M	M	D	D	M			M
NR 581 Grad Seminar (3)	M	M	M	D	M	M		D	M	D	D	D
NE 599 Thesis (9)	M	M	M	M	M	M		M	M			D
SS 501 Research Planning (4)	M	M	M	M	M	M		M	M	M		
RESTRICTED ELECTIVES (25)	D	D	D	D	D	D	D	D	D	D	D	D

It appears that most required and restricted elective courses for our M.S. Agriculture, Animal Science Specialization, M.S. Agribusiness, and M.S. Forestry Sciences curricula address ULOs, at least to an introductory degree. Fewer courses in these curricula address the University Diversity Learning Objectives, especially in the Animal Science curriculum.

## University Diversity Learning Objectives and CAFES Program Curricula

### Diversity Learning Objectives (approved 2008)

*All Students who complete an undergraduate or graduate program at Cal Poly should be able to make reasoned decisions based on a respect and appreciation for diversity as defined in the [Cal Poly Statement on Diversity](#), which is included in the catalog. They should be able to:*

- 1. Demonstrate an understanding of relationships between diversity, inequality, and social, economic, and political power both in the United States and globally*
- 2. Demonstrate knowledge of contributions made by individuals from diverse and/or underrepresented groups to our local, national, and global communities*
- 3. Consider perspectives of diverse groups when making decisions*
- 4. Function as members of society and as professionals with people who have ideas, beliefs, attitudes, and behaviors that are different from their own*

CAFES academic programs have a long tradition of addressing issues of diversity, whether in courses on agricultural labor (primarily Hispanic, but often Asian), agricultural Spanish language (previously offered, but now discontinued), or global trade and policy. Our faculty often have international experience, sometimes as returned Peace Corps volunteers, sometimes via consultancies, sabbaticals and other professional work. For example, our faculty in the Dairy Products Technology and Irrigation M.S. programs routinely work on international projects and host visiting foreign students and scientists in their labs. Other faculty in Food Science & Nutrition and Horticulture & Crop Science similarly collaborate with international colleagues on research and outreach projects. This broadens the teaching perspective of CAFES faculty and encourages our students to learn about other people, places and cultures. Finally, our CAFES Strategic Plan (2004) lists the following among 8 core values:

### **Diversity: We embrace diversity and responsiveness to emerging global issues**

As shown in the ULO tracking tables above, *Understanding Discipline in the Larger World*, and *A Respect for Diversity* are diversity-related ULOs addressed in our M.S. curricula in Agribusiness, Animal Science, and Forestry Sciences. Though we have done relatively little direct tracking of Diversity Learning Objectives to our curricula, the experiences of our faculty and regular enrollment of a diverse student body help create a program which embraces global perspectives.

### **Evidence of an Appropriate Culminating Experience**

See Direct Assessment Measure of Learning Outcomes – M.S. Thesis Review page 28.

## **Features of Quality Graduate Programs**

In its 2000 report entitled “*Graduate Education at Cal Poly: Challenges & Opportunities*”, Cal Poly’s Task Force on Graduate Education provided a set of features which define quality graduate programs. The categories of these features are listed below, along with input specific to our CAFES master’s degree programs. For example, with respect to governance of graduate programs, the report recommends that each “*department or program has a graduate coordinator*”, to assist with advising, management and other administrative functions. We have found this to be critical and consequently have identified departmental graduate coordinators (faculty) for all of our master’s degree programs and specializations. They coordinate advising, admission, and degree progress tracking of M.S. candidates with the CAFES Graduate Coordinator and Graduate Program Assistant.

### **Governance**

#### ***Graduate Program Staff Support***

CAFES provides direct support of graduate programs through two positions in the Deans’ office. The Associate Dean with responsibility for research and graduate programs serves as CAFES Graduate Coordinator and works closely with a Graduate Program Assistant to administer our M.S. programs, including handling admissions, disqualifications, advising, and other faculty and graduate student support. These staff interact daily with CAFES graduate students and their faculty mentors, and are able to monitor program quality and facilitate program improvements as resources allow. The Associate Dean and Graduate Program Assistant also interact frequently with the offices of Research & Graduate Programs, Admissions, Housing, International Education & Programs, Records, Financial Aid, and our Library to support the needs of graduate students and their faculty mentors.

#### ***College and University Committees***

The CAFES Graduate Studies and Research committee meets once or twice each quarter and communicates frequently by email to discuss issues related to our master’s degree programs. Recommendations from this committee have strengthened our graduate program by: revising M.S. curricula; establishing policies regarding application deadlines, continuous enrollment requirements, GRE and letters of recommendation, etc; developing brochures and web-based information; and sharing success stories from various departmental M.S. specializations and off-campus graduate programs. This group also assists the CAFES Graduate Coordinator in identifying suitable graduate students for scholarships (e.g. Hull and McOmie) and University awards for outstanding M.S. students and theses.

The University Graduate Studies Committee chaired by Research & Graduate Programs Dean, Dr. Susan Opava, and assisted by Thesis Editor, Becky Powell, provides CAFES faculty opportunities for evaluating our master’s degree programs and learning from others on campus about how they deliver quality graduate education.

### **Curriculum**

All CAFES master’s degree curricula require a minimum of 45 quarter units, with the exception of our M.S. Agribusiness degree, which requires 47-50 units. Cal Poly requires that at least 50% of course units in a master’s degree program be at the 500 level, with the remainder at the 400



level. The Task Force on Graduate Education (2000) recommended that graduate level (e.g. 500) courses should comprise at least 70% of a program. In practice, most CAFES graduate students do not attain the 70% mark for 500 level coursework in their Formal Study Plans. Our Agribusiness M.S. students tend to exceed the 70% 500-level course mark as their program prescribes a majority of courses at the graduate level.

Most CAFES M.S. degree programs offer a relatively small number (3-5) of 500 level courses, beyond the departmental seminar (581) and thesis (599) courses. The majority of other 500 level courses tend to be directed study format by one name or another: e.g. DSCI 570, Selected Topics in Dairy Science; AG 539, Graduate Internship; and HCS 500, Individual Study. Many CAFES graduate students take AG 581, Graduate Seminar and SS 501, Research Planning, to augment departmental graduate course offerings. Graduate-level statistics courses are also taken by most CAFES graduate students.

The relative lack of specialized graduate courses is something we need to improve on, to raise the level of rigor in our graduate program. One option is to offer more cross-listed graduate courses, e.g. a *human and animal nutrition* course, or *ecological methods*, which could be team-taught across two or more departments, and serve graduate students from at least two degree specializations. This approach should also address the problem of offering specialized courses in programs with small numbers of graduate students.

### **Faculty**

The vast majority of CAFES faculty who advise graduate students hold a terminal degree and have relevant professional experience in their discipline (Appendix J). Many, but not all of the faculty perform applied research, usually in cooperation with their graduate and undergraduate students, who often present or co-author original research findings (Appendix K).

As Cal Poly matures as an institution, faculty expectations for scholarly activity are increasing. The Teacher-Scholar model for faculty is widely, though not universally, accepted. CAFES faculty generally embrace this concept, with a resulting increase in research activity, and some evidence of increased interest in graduate programs. This is partly reflected by CAFES external research funding, which has grown significantly to average over \$6.4M annually since 2005. The creation of new M.S. degrees in Agribusiness and Forestry Sciences in 2003, plus a newly proposed M.S. in Nutrition (2010) indicate growing faculty interest in strengthening CAFES graduate programs.

### **Resources**

Cal Poly faculty and support staff are committed to graduate programs to varying degrees. Staff from Admissions, Records & Evaluations, Financial Aid, Housing, the Library (Appendix L) and other campus offices all are willing to assist graduate students, but often are constrained by lack of resources (time & money) to give a high level of support. In fact, the efforts of some campus staff (e.g. Cindee Bennett-Thompson in Admissions) border on heroic, given the available resources to serve this relatively small campus population (~1,000 vs. >18,500 undergraduates). The same may be said of most faculty, who often feel overwhelmed with undergraduate teaching responsibilities and consequently find little time for graduate students. Nevertheless, the vast majority of campus personnel who routinely work with graduate students provide solid support.

Each CAFES graduate student is assigned a major professor (committee chair) upon admission to the program. They are then encouraged to form the balance of their graduate committee (3 members, total) in their first quarter in the program. Similarly, we encourage all CAFES graduate students to draft a Formal Study Plan for their master's degree program within their first quarter or two. The Graduate Program Assistant tracks progress to degree for all CAFES graduate students, and in consultation with the Graduate Coordinator, places holds on students who fail to make adequate degree progress.

Facilities to support CAFES graduate students vary considerably by program. As mentioned earlier, office space is available for some but not all graduate students. This is a significant deficiency which is difficult to remedy, given CSU space-generation formulas, which do not include graduate student offices. Laboratory research space and equipment is generally well supplied for M.S. students in *Animal Science*, *Dairy Products Technology*, *Irrigation*, and *Plant Protection Science*, and to a lesser degree in *Crop Science*, *Environmental Horticulture*, *Food Science & Nutrition*, *Soil Science*, *Forestry Sciences*, and *Agricultural Engineering Technology*. This is an improvement since our last CAFES Academic Program Review (Appendix M) and is due to a combination of State and soft money support along with faculty/administrative creativity.

Field, greenhouse, and animal/crop production unit research support facilities are adequate to support a quality graduate program. Computing support in CAFES and campus-wide is good, with wireless networks increasingly common. Recently, our CAFES computing support staff made cycled-out faculty workstations available to graduate students as newer machines became available.

Financial aid varies widely for CAFES graduate students and was briefly described previously. Research assistantships are available to perhaps 25% of CAFES graduate students, virtually all supported by faculty research grants. Teaching assistantships are quite rare, generally coming in the form of a partial teaching assignment mixed with research responsibilities, rather than the traditional 0.5FTE teaching assignment. CAFES has not generally utilized graduate TAs for classroom instruction, so there is considerable potential to increase this.

### **Access and Assessment**

The CAFES graduate program is open to all qualified students, regardless of ethnicity, country of origin, socio-economic status, or other non-academic characteristics. Our graduate students represent a diverse cross-section of ethnic and geographic backgrounds, which has enriched the experience for all students and faculty in our program.

In terms of assessment, we track student progress to degree via a student database as well as quarterly reviews for academic probation/disqualification. Our Graduate Program Assistant sends regular emails to master's degree candidates alerting them of concerns which need addressing, or opportunities for assistance on campus. As needed, the Graduate Coordinator and Graduate Program Assistant meet with graduate students (sometimes including major professors) to assess problems the student is facing and offer advice and counseling to improve the situation.

On very rare occasions, the Graduate Coordinator has dismissed CAFES master's degree candidates from the program, when degree completion seemed unlikely.

### **Graduate School Culture**

Establishing a graduate school culture in CAFES is a key goal going forward. We find that the transition from undergraduate to graduate studies is difficult for some students, particularly for Cal Poly students continuing their studies here. We start by requiring each incoming student to have a graduate committee chair (major professor) before we accept them into the program. Students are encouraged to begin correspondence with their committee chair well before starting classes or even arriving on campus.

Quarterly pizza lunches are held to orient new CAFES graduate students to our program. These introduce graduate students to each other, and to the CAFES Graduate Coordinator, Graduate Program Assistant, Research & Graduate Programs Thesis Editor, and CAFES Librarian. Each student receives a *Graduate Program Reference Guide* and hears from staff and faculty presenters about our graduate program. Second-year graduate students are invited to share their experiences, as well. Students report the value of these orientation sessions in getting them off to a good start. Many students are repeat attendees, in part due to the free lunch, but often to re-connect with their peers.

AG 581, *Graduate Seminar*, is available each fall to all CAFES graduate students. Topics cover a wide range of disciplines relevant to our students.

Some CAFES faculty have established a graduate student culture within their own lab teams, which may include undergraduate students. Weekly research meetings, journal clubs, and even social get-togethers are facilitating a sense of camaraderie and professional growth among selected groups of students, which is exciting to see.

Since 2009, all CAFES thesis defenses have been organized and advertised by our Graduate Program Assistant. This has led to increased attendance by CAFES students (graduate and undergraduate) and faculty at these culminating experiences, and has considerably raised the level of professionalism of defending students.

In the last couple of years, the Provost and Dean of Research & Graduate Programs have hosted a reception for graduate students and faculty mentors. This also contributes to the graduate school culture and shows high-level administrative support for graduate programs.

## Goals to Improve the Graduate Program

Based on our findings in this Self Study Report, we have the following goals to improve the CAFES Graduate Program. We recognize that our reviewers will make other suggestions that we will want to adopt.

- Shorten time to degree completion for all CAFES graduate programs.
- Add 500-level courses, particularly cross-disciplinary courses (e.g. FSN/ASCI seminar).
- Develop new M.S. curricula, where demand and/or resources are in place to support new programs (e.g. M.S. Environmental Sciences, M.S. Food Systems, Master of Professional Studies in Dairy Products, etc.).
- Develop a library course to assist M.S. candidates in starting their thesis work (e.g. literature review, outline of research, etc.).
- Develop CAFES Thesis Guidelines for distribution to all M.S. candidates, with input from the CAFES Graduate Studies and Research Committee.
- Increase the publication rate of M.S. thesis research in peer-reviewed journals.
- Increase the use of M.S. candidates hired as Teaching Associates in lab/activity sections.
- Increase the diversity of CAFES graduate students (i.e. ethnic, international, non-resident domestic).
- Strengthen support for international and domestic non-resident students (e.g. CAFES to provide Non-Resident Tuition Waivers in addition to university tuition waiver support).
- Increase enrollment in M.S. Agribusiness and other grad program specializations, as appropriate.
- Discuss the pros and cons of a “Graduate Faculty” program.
- Update CAFES graduate programs website.

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