Department of Plant Science

2019-20 Annual Report

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Executive Summary: The department has been focusing on the jointly established guidelines from the most recent 5-year Action Plan, primarily the following key points: 1) prerequisite knowledge, 2) controlled environment (Hort Unit) facilities and staffing, 3) effectiveness of our revised curriculum, and 4) existing articulation agreements, and advising sheets. Overall the department has been making progress in all four areas, most notably 1, 3, and 4, and is currently working with various stakeholders to address unique challenges facing the multi-use Hort Unit facility (2), including economic sustainability, industry-standard operation, student training etc. This effort aligns with the department's goal to embark on a dedicated initiative to engage students more actively in all aspects of the university agriculture laboratory. Undergraduate enrollment increased from 2005 by 398% to 243, and graduate enrollment increased by 460%. The most recent program review suggested the graduate program has now reached stable enrollment, whereas, undergraduate enrollment will, or in many areas has already, exceed(ed) available space and personnel resources. Fall 2015 four-year freshman graduation rates are at 33%, up from 18.8% the previous year, and now 11% points above the 2025 graduation goal for this cohort. The fall 2013 6-year graduation rate for freshmen exceeds the 2025 goal at 66.7%, up from the 53.3% in the previous year. The fall 2016 "degree within 3 years" for transfers is at 84.6%, up from 73.9% in the previous year, and at 91.3% within 4 years, up from 85.7% in the previous year. While our department does not currently have any high DFW classes, we are working with our colleague departments on high fail rate prerequisite courses required for our majors, as well as addressing one department lower division elective (required for some non-majors) that is near the 35% threshold for consideration as a DFW course. The workplace quality survey completed by the university did provide some interesting data, but given the low response rate, and lack of clear direction for completion the department elected to not devote already limited time and resources to dissecting individual items, or to use the limited aggregate data to shape department policy or culture. We did; however, use some of the data that validated our ongoing effort to ensure our peer-review process was more formative and expeditious. Although this crisis brought about by COVID-19 has been overwhelmingly disruptive, the department remains unwaveringly focused on our mission to *"to ensure our students graduate with the skills and knowledge necessary to become leaders in modern, scientifically based, economically and environmentally sound agriculture*". Our faculty have continued our department's tradition of student-involved research, with over $400k in federal, state, and private funds this past AY alone, and nearly 50 research presentations at local, national, and international professional conferences in collaboration with an extensive list of industry, university, and government research partners; all while actively participating in a wide-array of committees, advisory boards, and discipline-related organizations.

Goals: The department's 2008 action plan focused on "*design and implementation of a comprehensive student recruiting plan*". In 2005, the department's undergraduate enrollment was 61 and graduate enrollment was 5. As of fall 2019, undergraduate enrollment increased by 398% to 243, and graduate enrollment increased by 460% to 23. Unfortunately, faculty, staff, classroom/laboratory space, and the department budget have remained at 2005 levels. The most recent program review suggested the graduate program has now reached stable enrollment, whereas, undergraduate enrollment will, or in many areas has already, exceed(ed) available space and personnel resources. The most recent review recommended approval as a "...*program with exceptional quality*", but also provided some valuable guidance for the department's future. As such, the department is now redirecting its vision to address some of the key issues outlined below; specifically focusing on enhancing program quality rather than quantity.

- *Ensure prerequisite knowledge in biological sciences and chemistry exists within sophomore and transfer students majoring in Plant Sciences.*

We have been working closely with our colleagues in the Departments of Biology (BIOL 11) and Chemistry (CHEM 3A/3B and 8) in reviewing course content, and expectations for our freshman class. We have also spent considerable time meeting with individual feeder community college faculty and advisers (West Hills, Hartnell, Reedley, Fresno City, Clovis Community, College of Sequoias) to ensure pre-transfers are being advised properly if considering the Plant Science Major at Fresno State. We are continuing this effort over the 2020-21 AY with focus on more northern feeder community colleges (Modesto, Merced, San Joaquin Delta, etc.). Once complete we will expand this effort to include those community colleges that are increasingly sending students to Fresno State (Bakersfield, Cuesta, Porterville, Santa Rosa, Allan Hancock etc.).

We are still developing our proposed Qualtrics online survey to directly measure the level of prerequisite knowledge and preparedness of our sophomore-junior students. Our intent is to obtain a more in-depth understanding of any barriers to student success within the major, specifically identifying gaps in prerequisite knowledge in biological sciences, chemistry, and mathematics (see below section regarding high DFW courses). We have yet been able to secure faculty release to conduct this survey as proposed in our action plan; however, we have begun to utilize the expertise provided by our Office of Institutional Effectiveness.

- *Focus efforts to upgrade our controlled environment facilities (Horticulture Unit) that are essential for the success of both the teaching and research mission of the department.*

The department continues to examine the following ten (10) items specific to the Horticulture Unit. 1) Assess historical, and current use of facilities, 2) Re-evaluate, or

identify existing key facility components, 3) Develop a clear plan for maximizing use of facilities, 4) Develop a plan for facility sustainability, 5) Production costs/returns, 6) Inclusion in research funding requests, 7) Use of returned indirect for research, 8) Assess historical, and current staffing of facilities, 9) Re-evaluate, or identify existing staffing needs, and 10) Develop a clear plan for maximizing the use of existing staff.

Our Ag One development team has been provided a detailed list of items etc. required (est. costs = $750,000.00 to $1,000,000.00) to renovate all environmental controls for the four existing glass, and one polycarbonate greenhouse(s), and installation of two new larger polycarbonate (3300 sq ft each) greenhouses.

- *Assess effectiveness of our revised curriculum that removes the two options areas (Plant Health and Crop Production Management) to ensure all students complete the B.Sc. with the same core courses completed, and also allows for more flexibility in upper-division career specific oriented coursework (production, plant health, mechanized agriculture, graduate school, extension, etc.).*

The new curriculum was approved and implemented in fall 2019. All majors are now required to complete the following fundamental life and physical science courses (all require laboratory sections): CHEM 3A – Intro General Chemistry or CHEM 1A – General Chemistry, CHEM 3B or 8 – Inorganic Chemistry or Inorganic/Biochemistry, BIOL 11 – Plant Biology, or a combination of BIOL 1A – Intro Biology and PLANT 1 – Intro to Plant Science. In addition, all majors are now required to complete CHEM 150 - General Biochemistry, PLANT 101 - Crop Nutrition, and either PLANT 107 - Plant Propagation, or PLANT 108 Micropropagation. Lastly, all majors are required to complete a MATH 11 - Introduction to Statistics course as a prerequisite to the department's PLANT 99 - Introduction to Biometrics course.

Approximately 50% of previous catalog year students are required to complete either CHEM 3B, CHEM 8, or PHYS 2A, and were not required to complete CHEM 150 so there will be some increased demand for the latter course. The Chemistry department is now offering CHEM 150 either online, or in summer session to accommodate additional students, and transfer students are now advised to complete both CHEM 3A and CHEM 3B/8 prior to transferring. New AS-T degrees in Plant Science are in progress for primary feeder community colleges that include such (as well as BIOL 11 or equivalent).

- *In collaboration with the department's assigned articulation officer, JCACDC advising, and outreach team review all existing articulation agreements, and prepare revised advising sheets for freshman and transfer students.*

Following approval of the new curriculum a draft AS-T has been completed with Reedley College and as we understand is pending review by the California Community Colleges Chancellor's Office. Key to this "*Degree with a Guarantee*" is the inclusion of BIOL 11,

CHEM 3A, and MATH 11 equivalents. Department faculty are working closely with Jordan College Advisors and Community College Advisors and Faculty to adopt clear roadmaps for transfers once this has been formally adopted. A check sheet for the new curriculum (including the new prefix system MEAG and PLANT only) has been finalized and in use for the past 6 months, and has now been adopted for the 2020-21 Dog Days cohort (Figure 1).

2020-21 Plant Science B.Sc. Planning Checklist**

California State University, Fresno

For planning purposes only - Consult the official University Catalog for all advising notes, prerequisites, etc.
http://fresnostate.edu/catalog/subjects/plant-science/plant-sci.html

Student Name: **Email Address:** **Phone # (optional):**

Transfer Student? Yes No **Catalog Year: 20____** **Projected Graduation Semester/Year:**

General Education/Supporting Courses *Prerequisites in parentheses/ Must obtain a "C" or higher in all prerequisites*	**Units**	**Semester Offered**	**Planned Completion**	**Semester Completed**
GE A1 - Oral Communication	3	Fall/Spring		
GE A2 - Written Communication	3	Fall/Spring		
GE A3 - Critical Thinking	3	Fall/Spring		
GE B1 - CHEM 3A Introductory General Chemistry	4	Fall/Spring		
GE B2 - BIOL 11 Plant Biology [**see note below]	3	Fall/Spring		
GE B3 - Laboratory Component	-----	Fall/Spring		
GE B4 - MATH 11 Elementary Statistics	3	Fall/Spring		
GE C1 - Arts	3	Fall/Spring		
GE C2 - Humanities	3	Fall/Spring		
GE C1 or C2 - Arts or Humanities	3	Fall/Spring		
GE D1 - American History	3	Fall/Spring		
GE D2 - American Government	3	Fall/Spring		
GE D3 - AGBS 1 Agricultural Business	3	Fall/Spring		
GE E - Lifelong Understanding and Self-Development	3	Fall/Spring		
GE IB - Physical Universe and Its Life Forms	3	Fall/Spring		
GE IC - Arts and Humanities	3	Fall/Spring		
GE ID - Social, Political, and Econ. Inst. and Behav., Hist. Background	3	Fall/Spring		
Multicultural and International (MI) Requirement	3	Fall/Spring		
CHEM 8 Intro Org Chem or CHEM 3B Elem Org/Biochem (CHEM 3A)	3	Fall/Spring		
CHEM 150 General Biochemistry (CHEM 3A and 3B or 8)	3	Fall/Spring		
UD Writing Skills Requirement (PLANT 110W recommended, or UD Writing Exam)	----	Fall/Spring		
Core Courses ***Prerequisites in parentheses/ Must obtain a "C" or higher in all prerequisites***	**Units**	**Semester Offered**	**Planned Completion**	**Semester Completed**
MEAG XX or XXX (based on field of study)	3	Fall/Spring		
PLANT 71 Agricultural Water	3	Fall/Spring		
PLANT 99 Intro to Biometrics (MATH 11 or any Intro/Elem Statistics course)	3	Fall/Spring		
PLANT 100 Aspects of Crop Productivity (BIOL 11)	3	Fall/Spring		
PLANT 101 Crop Nutrition (PLANT 172)	3	Spring		
PLANT 107 or 108 Plant Propagation/Micropropagation (BIOL 11, CHEM 3A)	3	Fall/Spring		
PLANT 150 Crop Improvement (BIOL 11)	3	Fall/Spring		
PLANT 160 Weeds (BIOL 11 & CHEM 3A)	3	Spring		
PLANT 161 Plant Pathology (BIOL 11)	3	Fall		
PLANT 162 Economic Entomology (BIOL 11)	3	Fall		
PLANT 163 Integrated Pest Management (PLANT 162)	3	Spring		
PLANT 172 Soils (CHEM 3A)	3	Fall		
PLANT 172L Soils Lab (PLANT 172 (may be concurrent))	1	Fall		
PLANT 180, 190, 194I, 196 Senior Experience	1	Fall/Spring		
Electives ***Must obtain a "C" or higher in all prerequisites. Lower division electives may not be completed after upper divison courses within the same discipline area.***	**Units**	**Semester Offered**	**Planned Completion**	**Semester Completed**
LOWER or UPPER DIVISION_____	3	Fall/Spring		
LOWER or UPPER DIVISION_____	3	Fall/Spring		
LOWER or UPPER DIVISION_____	3	Fall/Spring		
UPPER DIVISION_____	3	Fall/Spring		
UPPER DIVISION_____	3	Fall/Spring		
UPPER DIVISION_____	3	Fall/Spring		
UPPER DIVISION_____	3	Fall/Spring		
UPPER DIVISION_____	3	Fall/Spring		
Total Units	**120**			

An "Introductory/Elementary/Fundamental Biology" combined with an "Introduction to Plant Science" course may be substituted for BIOL 11 - Plant Biology (Requires department approval and a permission number for all courses requiring BIOL 11)

Version - 5-5-2020

Figure 1. 2020-21 New Plant Science B.Sc. Planning Checklist

- *Work with the campus' Web Services team to upgrade the department's web presence, to include greater reference to faculty expertise and scholarly activity, student opportunities, and potential careers for graduates.*

The department's website is continually being updated, to include faculty (full and part time) biographies, and contact information in collaboration with the Jordan College communications team. Much of the outdated information has been removed and the department has begun utilizing the CANVAS platform as a resource for student information and is also using Bulldog Connect for department emails/announcements to students. The department has significantly reduced its official presence on social media (Facebook, etc.); however, the department's affiliated clubs and individuals retain a social media presence. We intend to continue this effort, and expand to include plant science-related UAL enterprises.

- *Embark on a dedicated initiative to engage students more actively in all aspects of the university agriculture laboratory, including creation and integration into the curriculum of a 2-semester series of "Field Applications in Agricultural Sciences" course.*

The department remains interested in working closely with our Ag One development team to secure external support for a faculty line with expertise in Organic Production systems, and within this proposal includes a field-based 2-semester course. In the interim, the department is working to include related field-based courses within the new curriculum (this includes a Bee Biology and Apiary Science course to address pollinator issues etc., and the inclusion of Soils in the Environment course as an upper division elective in the major).

Student Success: Graduation Rates, Retention Rates, Closing the Loop

Enrollment: Undergraduate enrollment in the Department of Plant Science continues to increase (Figure 2a) whereas graduate student enrollment in the Department of Plant Science has remained relatively consistent (Figure 2b). In 2005 the department's undergraduate enrollment was 61 and graduate enrollment was 5. As of fall 2019, undergraduate enrollment increased by 398% to 243 and graduate enrollment increased by 460% to 23.

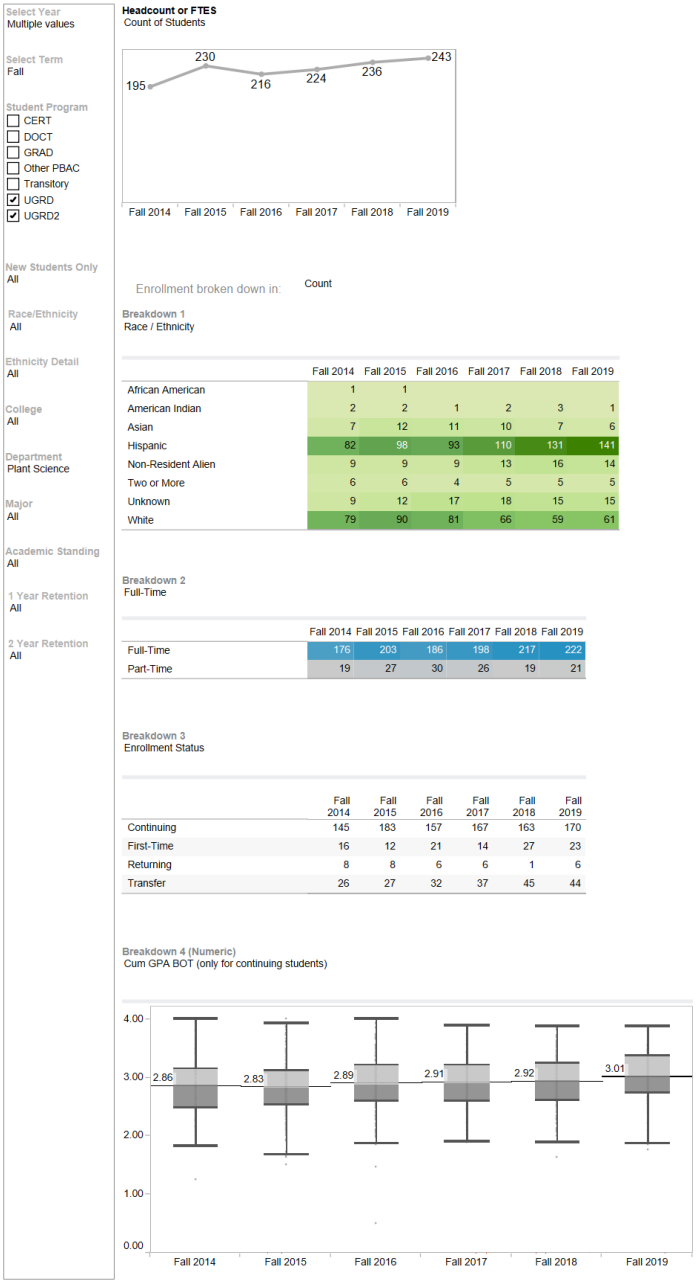


Figure 2a. 2014-19 Undergraduate enrollment for the Department of Plant Science

- Data source: Office of Institutional Effectiveness

	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019
American Indian	1	1	1		1	1
Asian	1	1	1		2	2
Hispanic	7	7	4	4	5	5
Non-Resident Alien	5	4	3	3	6	4
Pacific Islander	1					
Two or More		1	1	1	1	1
Unknown	2	2	2	2	2	1
White	3	1	1	4	7	9

	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019
Full-Time	5	4	5	6	12	6
Part-Time	15	13	8	8	12	17

	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019
Continuing	13	14	8	8	15	19
First-Time	5	3	4	4	9	3
Returning						1
Transfer	2		1	2		

Figure 2b. 2014-19 Graduate enrollment for the Department of Plant Science

- Data source: Office of Institutional Effectiveness

DFW courses: While our department does not currently have any high DFW classes, our students are required to complete BIOL 11 - Plant Biology as a prerequisite for many of our core, and elective upper-division courses, and this course does have a >35% fail rate for first-time freshman (Figure 3a). As such we have been working closely with the Department of Biology to examine any areas that might be modified to improve student success, without compromising rigor. We do recognize that the fail rate for one of our courses (PLANT 20) is near that threshold (at 34.4%), and therefore have been working within our department to examine any areas that might be modified to improve student success, without compromising rigor (Figure 3b). As enrollment in this course is primarily composed of non-majors, we have also been working with the student's home department (primarily ASAE) to ensure course content mirrors that required by teacher credentialing mandates.

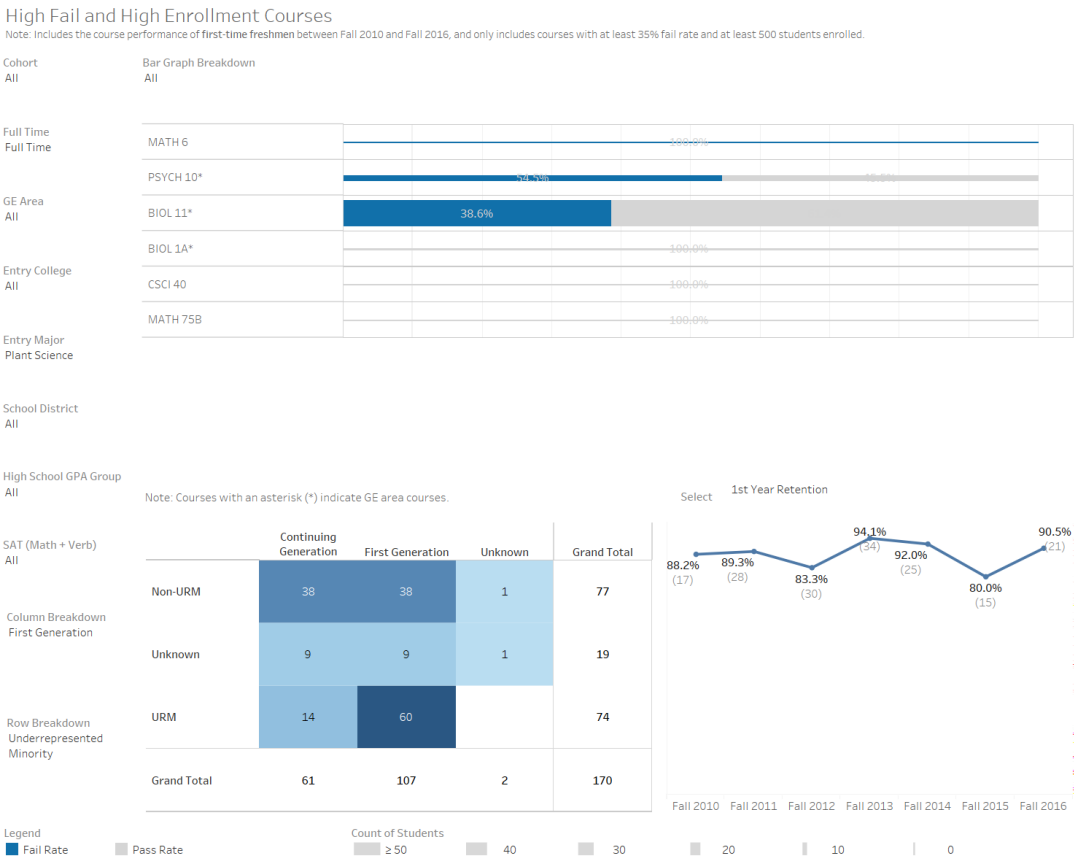


Figure 3a. High DFW courses required by the Plant Science major

- Data source: Office of Institutional Effectiveness

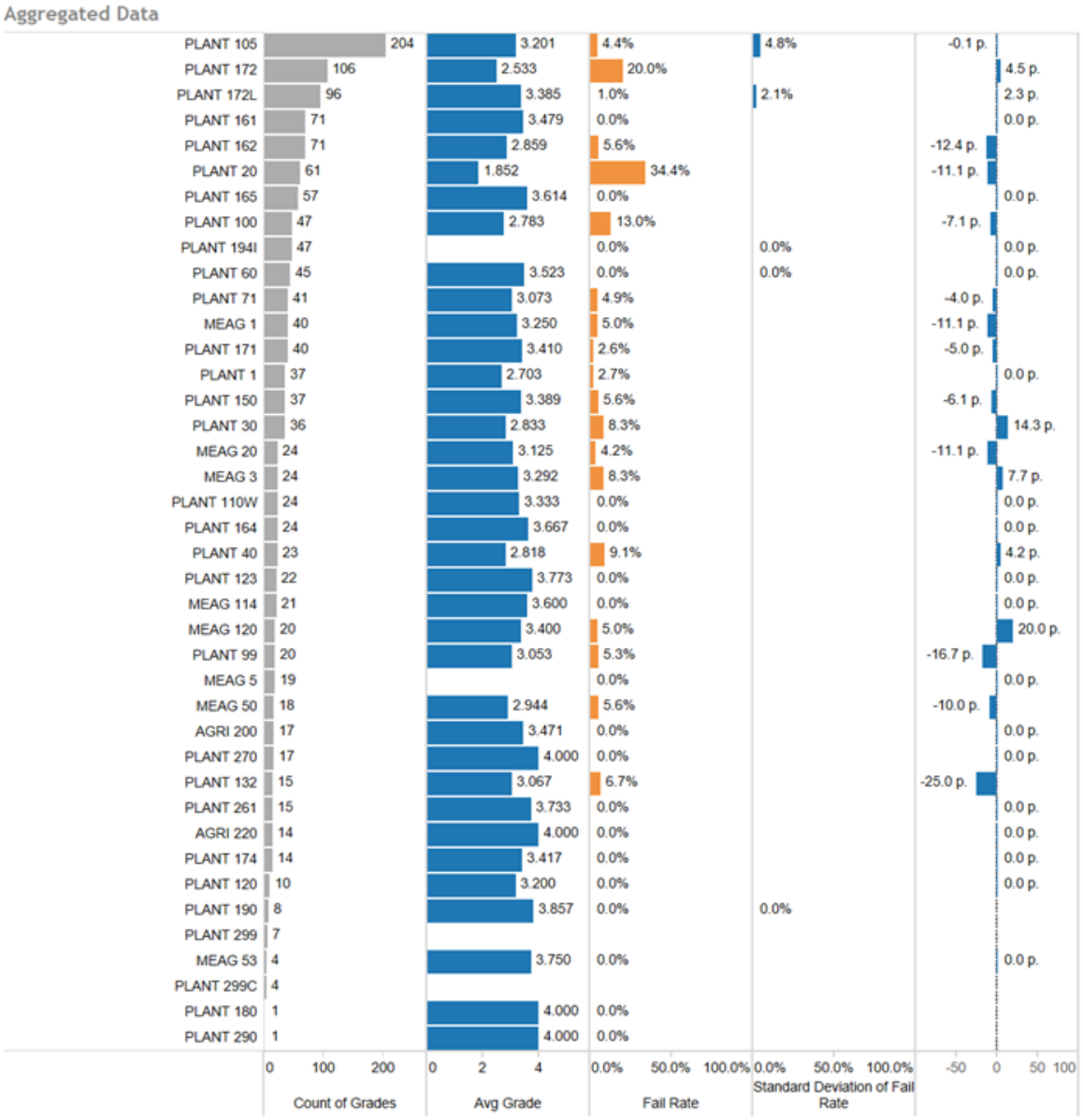


Figure 3b. Grade distribution for courses taught within the Department of Plant Science

- Data source: Office of Institutional Effectiveness

Graduation Initiative - 2025: Fall 2015 four-year freshman graduation rates are at 33%, up from 18.8% the previous year, and now 11% points above the 2025 graduation goal for this cohort. The fall 2013 6-year graduation rate for freshmen exceeds the 2025 goal at 66.7%, up from the 53.3% in the previous year. The fall 2016 "*degree within 3 years*" for transfers is at 84.6%, up from 73.9% in the previous year, and at 91.3% within 4 years, up from 85.7% in the previous year. Both were above the 2025 graduation goal for this cohort (Figure 4a-c).

Although likely too early to accurately assess reasons for these increases, we envision our; 1) increased, and successful effort to ensure uniform course offerings, and sequencing, and 2) increased efforts to ensure students take ownership of their degrees progress, including their regular access to degree progress reports rather than relying solely on advising staff are likely contributing factors. We have also been phasing in our new curriculum with course substitutions of similar rigor/content (via ARRC) to more quickly permit existing students to more fully incorporate previously taken coursework into the 4-year degree. The department is also actively cooperating with feeder community colleges to ensure those students considering transfer to our program take full advantage of all transferable coursework prior to transfer. This remains a challenging task as many 2-year campuses focus primarily on providing technical training required for state-wide licensing etc., and not providing necessary coursework for transfer (Introductory Biology and Chemistry).

Our recent program review confirmed that lack of space and personnel resources to accommodate more students remains a significant challenge; "*The existing instructional laboratories are over-subscribed* ", and " *The faculty are literally one-deep in many of the courses that need to be taught*". This most recent review team also highlighted that "*Admission to the program seems to outstrip department/college/university resources and should be tied more closely to faculty numbers.*

Full-Time First-Time Freshman Cohorts

Entry Cohort	Cohort Size	Avg. Entry GPA	Avg. 1st Term GPA	Avg. Ret after 1st Term	Avg. Ret after 1 Year	Avg. Ret after 2 Years	Avg. Deg within 3 Years	Avg. Cont after 3 Years	Avg. Deg within 4 Years	Avg. Cont after 4 Years	Avg. Deg within 5 Years	Avg. Cont after 5 Years	Avg. Deg within 6 Years	Avg. Cont after 6 Years
Fall 2010	8	3.42	3.18	100.0%	75.0%	75.0%	0.0%	62.5%	12.5%	62.5%	50.0%	25.0%	50.0%	37.5%
Fall 2011	11	3.32	2.40	100.0%	81.8%	81.8%	0.0%	81.8%	27.3%	54.5%	63.6%	18.2%	63.6%	18.2%
Fall 2012	15	3.03	2.44	93.3%	73.3%	46.7%	0.0%	53.3%	6.7%	46.7%	40.0%	13.3%	53.3%	6.7%
Fall 2013	18	3.40	2.72	100.0%	88.9%	77.8%	0.0%	77.8%	27.8%	50.0%	50.0%	16.7%	66.7%	0.0%
Fall 2014	16	3.17	2.35	93.8%	87.5%	68.8%	0.0%	68.8%	18.8%	43.8%	56.3%	0.0%		
Fall 2015	12	3.22	2.42	100.0%	75.0%	58.3%	0.0%	58.3%	33.3%	25.0%				
Fall 2016	21	3.45	3.15	100.0%	90.5%	85.7%	0.0%	85.7%						
Fall 2017	14	3.62	3.10	100.0%	92.9%	78.6%								
Fall 2018	25	3.59	2.81	100.0%	88.0%									
Fall 2019	23	3.41	2.39											
Grand Total	163	3.38	2.69	98.6%	85.0%	72.2%	0.0%	71.3%	21.3%	46.3%	51.5%	13.2%	59.6%	11.5%

Figure 4a. Cohort Retention, Graduation and Persistence for the Department of Plant Science FTF - *Data source: Office of Institutional Effectiveness*

Full-Time New UGRD Transfer Cohorts

Entry Cohort	Cohort Size	Avg. Entry GPA	Avg. 1st Term GPA	Avg. Ret after 1st Term	Avg. Ret after 1 Year	Avg. Ret after 2 Years	Avg. Deg within 3 Years	Avg. Cont after 3 Years	Avg. Deg within 4 Years	Avg. Cont after 4 Years	Avg. Deg within 5 Years	Avg. Cont after 5 Years	Avg. Deg within 6 Years	Avg. Cont after 6 Years
Fall 2010	26	3.07	2.86	100.0%	92.3%	65.4%	61.5%	7.7%	65.4%	3.8%	65.4%	3.8%	65.4%	3.8%
Fall 2011	23	2.94	2.73	100.0%	95.7%	73.9%	65.2%	17.4%	87.0%	4.3%	87.0%	4.3%	87.0%	4.3%
Fall 2012	15	3.07	2.46	100.0%	86.7%	86.7%	53.3%	40.0%	86.7%	6.7%	93.3%	0.0%	93.3%	0.0%
Fall 2013	44	2.92	2.63	95.5%	97.7%	81.8%	72.7%	13.6%	77.3%	6.8%	84.1%	2.3%	86.4%	0.0%
Fall 2014	21	3.13	2.78	95.2%	85.7%	81.0%	81.0%	4.8%	85.7%	0.0%	85.7%	0.0%		
Fall 2015	23	3.26	2.95	100.0%	95.7%	73.9%	73.9%	17.4%	91.3%	4.3%				
Fall 2016	26	3.00	2.90	100.0%	96.2%	80.8%	84.6%	7.7%						
Fall 2017	31	3.03	3.07	100.0%	93.5%	58.1%								
Fall 2018	42	3.13	2.90	97.6%	92.9%									
Fall 2019	40	3.31	3.18											
Grand Total	291	3.09	2.87	98.4%	93.6%	74.6%	71.3%	14.0%	80.9%	4.6%	82.2%	2.3%	82.4%	1.9%

Figure 4b. Cohort Retention, Graduation and Persistence for the Department of Plant Science Transfers - *Data source: Office of Institutional Effectiveness*

FRESHMEN GRADUATION GOALS				
	Baseline Rate	*Peer Group Benchmark*	*Additional Improvement*	**2025 Goal**
6-Year Graduation Rate Goal (2019 Cohort)	48%	54%	6%	54%
4-Year Graduation Rate Goal (2021 Cohort)	14%	N/A	8%	22%
TRANSFER GRADUATION RATE GOALS				
4-Year Graduation Rate Goal (2021 Cohort)	68%	N/A	6%	74%
2-Year Graduation Rate Goal (2023 Cohort)	17%	N/A	8%	25%
FRESHMAN ACHIEVEMENT GAP GOALS				
6-Year URM/Non-URM Graduation Rate Gap Goal (2019 Cohort)	10%	N/A	50% Improvement	5%
4-Year Pell/Non-Pell Graduation Rate Gap Goal (2019 Cohort)	13%	N/A	50% Improvement	6%

Figure 4c. California State University, Fresno 2025 Graduation Goals - *Data source: http://www.fresnostate.edu/academics/studentsuccess/documents/Fresno-State-Goals.pdf*

Operational performance

Workplace quality survey: The workplace quality survey completed by the university did provide some interesting data that might prove useful for development of a subsequent, more-directed inquiry (Figure 5). It is difficult to interpret results that may, or may not be related to university, college, or department level inquiries. Low response rates (n=6), and lack of clear direction for completion may have resulted in conflicting responses. The department elected to not devote already limited time and resources to dissecting individual items, or to use the limited aggregate data to shape department policy or culture. Not surprisingly, there was consensus across campus that "*pay*" and "*personnel (faculty/staff) to be effective*" were inadequate, but our faculty also recognized this was not an issue that could be resolved at the department level. This was brought to the attention of the recently rejuvenated Council of Chairs, and has subsequently resulted in discussion university-wide regarding models to fully fund academic affairs as a priority. There was some discussion regarding the low score for "*our review process*

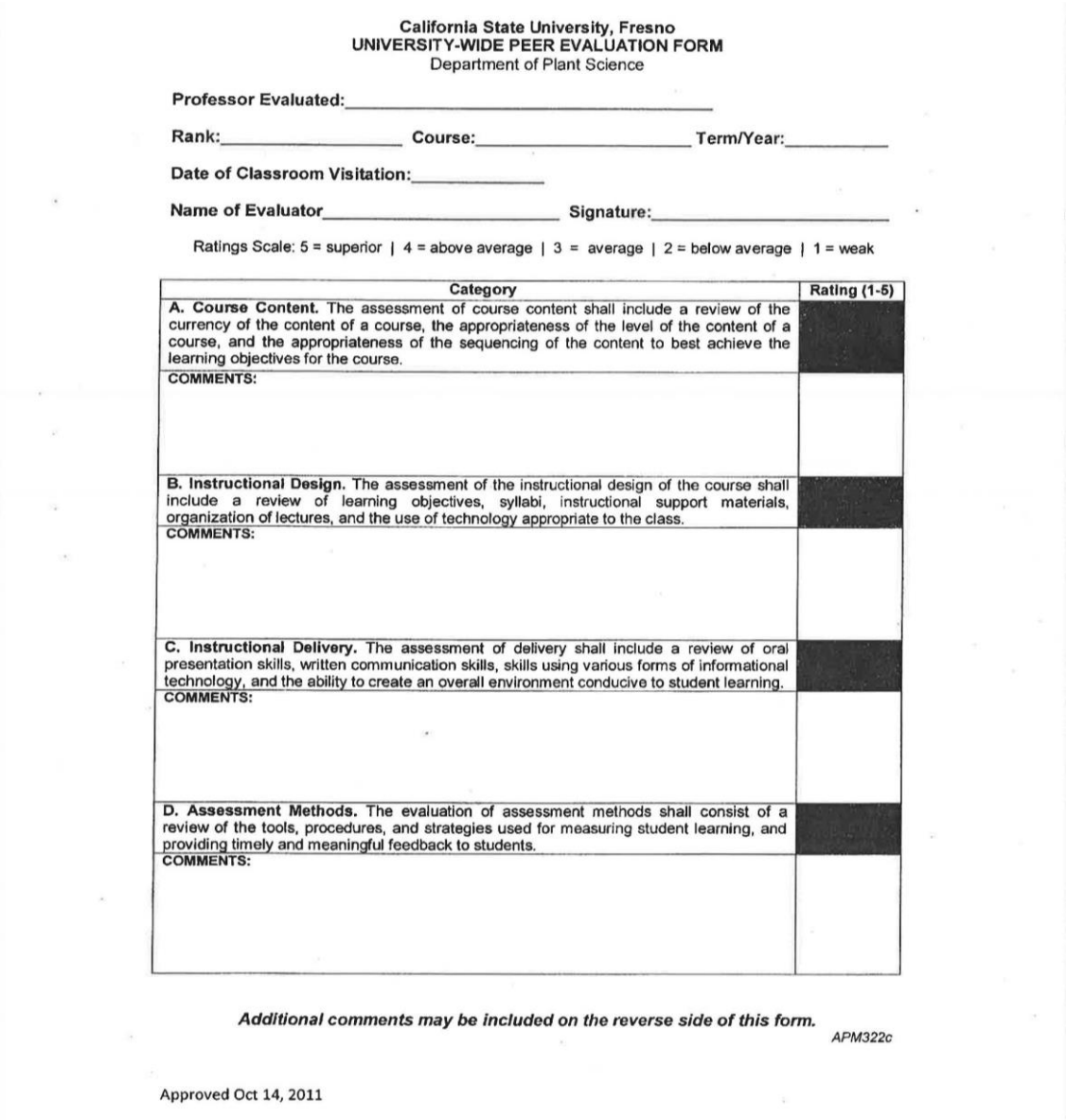
accurately measures my job performance", and "*there is appropriate recognition of innovative and high quality teaching*" yet we were not able to discern what, if anything might be done at the department level to address such if actual. This is also true for the "*issues of low performance are addressed*" question (low scores university-wide). Lastly, while we were unable to determine specifically why the "*received honest, meaningful feedback, and in a timely manner*" questions received low scores, we do have an existing initiative to revamp our peer evaluation process to create a more formative process, and remove difficult to interpret numerical scores (Figure 6a-b). We have also now instituted a DocuSign process for review, obtaining signatures etc. that should serve to expedite the review process. Overall, the department agreed that such surveys, when properly designed and implemented do have some value, and would consider data obtained from subsequent more-directed surveys in our department's strategic planning.

ModernThink
Workplace Quality Survey
California State University, Fresno
Year - to - Year ScoreCard - Full Data Set
Pre-Loaded Division: Academic Affairs
Jordan College of Agricultural Sciences

	2019 Overall		7 Overall		2019	
	Positive Response	Negative Response	Positive Response	Negative Response	Jordan College of Agricultural Sciences and Technology	Plant Science
Total number of survey respondents:	847	847	795	795	78	6
Job Satisfaction/Support						
My job makes good use of my skills and abilities.	79	6	79	6	87	100
I am given the responsibility and freedom to do my job.	83	5	83	4	94	100
I am provided the resources I need to be effective in my job.	66	16	64	18	65	67
Job Satisfaction/Support - Average	73	9	72	9	79	89
Teaching Environment						
There is a good balance of teaching, service and research at this institution.	64	12	62	12	66	67
Teaching is appropriately recognized in the evaluation and promotion process.	62	13	63	14	61	67
There is appropriate recognition of innovative and high quality teaching.	59	12	62	12	62	67
Teaching Environment - Average	68	16	69	17	60	53
Professional Development						
I am given the opportunity to develop my skills at this institution.	73	10	70	10	83	100
I understand the necessary requirements to advance my career.	69	13	70	11	71	83
Professional Development - Average	71	12	70	10	76	92
Compensation, Benefits & Work/Life Balance						
I am paid fairly for my work.	51	34	51	34	46	33
This institution's benefits meet my needs.	70	8	74	8	78	100
My supervisor/department chair supports my efforts to balance my work and personal life.	77	7	77	7	87	100
This institution's policies and practices give me the flexibility to manage my work and personal life.	69	11	70	10	68	100
Compensation, Benefits & Work/Life Balance - Average	67	15	68	15	69	96
Facilities						
The institution takes reasonable steps to provide a safe and secure environment for the campus.	72	8	75	8	73	83
The facilities (e.g., classrooms, offices, laboratories) adequately meet my needs.	61	27	61	27	53	50
Facilities - Average	66	18	68	18	63	66
Policies, Resources & Efficiency						
Our review process accurately measures my job performance.	66	17	66	19	67	67
My department has adequate faculty/staff to achieve our goals.	54	33	54	33	57	67
Our orientation program prepares new faculty, administration and staff to be effective.	45	31	47	31	49	60
This institution actively contributes to the community.	85	3	87	3	88	100
This institution places sufficient emphasis on having diverse faculty, administration and staff.	78	7	80	7	88	100
This institution is well run.	67	12	62	9	65	75
Policies, Resources & Efficiency - Average	60	16	61	16	61	65
Shared Governance						
The role of faculty in shared governance is clearly stated and publicized.	66	14	68	12	60	75
Faculty are appropriately involved in decisions related to the education program (e.g., curriculum development, evaluation).	62	14	68	12	65	75
Faculty, administration and staff are meaningfully involved in institutional planning.	50	14	52	15	48	50
Shared Governance - Average	66	12	69	12	64	61
Pride						
I understand how my job contributes to this institution's mission.	96	3	96	3	91	100
Overall, my department is a good place to work.	75	8	70	7	86	100
I am proud to be part of this institution.	79	8	82	7	83	100
This institution's culture is special - something you don't find just anywhere.	66	15	66	14	66	50
All things considered, this is a great place to work.	72	9	76	8	76	100
Pride - Average	74	9	77	8	79	90
Supervisors/Department Chairs						
My supervisor/department chair makes his/her expectations clear.	73	10	72	11	86	100
I receive feedback from my supervisor/department chair that helps me.	63	16	61	16	75	86
I believe what I am told by my supervisor/department chair.	70	9	74	8	83	67
My supervisor/department chair regularly models this institution's values.	73	10	72	11	81	83
My supervisor/department chair is consistent and fair.	71	11	72	11	90	100
My supervisor/department chair actively solicits my suggestions and ideas.	66	13	64	12	74	100
I have a good relationship with my supervisor/department chair.	77	8	78	8	82	100
Supervisors/Department Chairs - Average	71	10	71	11	81	90
Senior Leadership						
Senior leadership provides a clear direction for this institution's future.	62	14	61	14	47	60
Our senior leadership has the knowledge, skills and experience necessary for institutional success.	61	13	66	12	61	100
Senior leadership shows a genuine interest in the well-being of faculty, administration and staff.	56	19	62	13	54	100
Senior leadership communicates openly about important matters.	53	14	61	11	42	67
Senior leadership regularly models this institution's values.	64	11	70	9	61	100
I believe what I am told by senior leadership.	56	14	63	12	50	50
Senior Leadership - Average	57	15	64	11	53	74
Faculty, Administration & Staff Relations						
Faculty, administration and staff work together to ensure the success of institution programs and initiatives.	60	9	63	9	65	75
There is regular and open communication among faculty, administration and staff.	45	18	51	14	42	67
Faculty, Administration & Staff Relations - Average	53	14	57	10	54	71
Communication						
When I offer a new idea, I believe it will be fully considered.	58	16	61	14	69	67
In my department, we communicate openly about issues that impact each other's work.	54	19	55	16	66	100
Changes that affect me are discussed prior to being implemented.	47	31	49	31	59	50
At this institution, we discuss and debate issues respectfully to get better results.	50	16	53	11	48	50
Communication - Average	52	19	55	16	61	70
Collaboration						
We have opportunities to contribute to important decisions in my department.	62	15	64	15	75	83
People in my department work well together.	67	14	60	13	75	100
I can count on people to cooperate across departments.	51	14	55	11	51	83
There's a sense that we're all on the same team at this institution.	46	20	53	17	49	75
Collaboration - Average	54	16	58	14	63	85
Fairness						
I can speak up or challenge a traditional way of doing something without fear of harming my career.	66	17	59	19	64	67
Promotions in my department are based on a person's ability.	50	23	48	23	52	50
Issues of low performance are addressed in my department.	50	31	51	31	52	67
This institution's policies and practices ensure fair treatment for faculty, administration and staff.	53	17	58	13	61	100
This institution has clear and effective procedures for dealing with discrimination.	61	13	70	9	67	100
Fairness - Average	52	20	55	19	55	53
Respect & Appreciation						
I am regularly recognized for my contributions.	49	30	50	30	54	50
Our recognition and awards programs are meaningful to me.	42	34	42	34	46	50
At this institution, people are supportive of their colleagues regardless of their heritage or background.	65	12	74	9	72	50
We celebrate significant milestones and important accomplishments at this institution.	64	10	67	8	72	50
Respect & Appreciation - Average	55	18	60	16	61	65
California State University, Fresno Custom Statements						
People at Fresno State treat each other with respect.	56	10	65	7	65	100
I believe a culture of open discussion and debate exists at Fresno State.	54	15	62	10	49	75
The general environment for persons of different backgrounds is welcoming and respectful.	73	8	79	7	87	100
Fresno State supports a work environment where everyone is entitled to dignity and respect, regardless of race, color, religion, age, disability, ethnicity, sexual orientation or gender identity.	77	8	82	6	86	100
Fresno State acts effectively to retain a diverse faculty.	67	10	71	10	75	75
Fresno State acts effectively to retain a diverse staff.	68	11	70	9	73	75
The environment at Fresno State makes me feel like I am a valued member of this community.	60	13	63	13	72	100
I know what to do if I receive a report of sexual assault, harassment or interpersonal violence.	82	4	85	4	90	75
I believe that Fresno State's policies and practices are effective at preventing bullying.	59	14	68	11	61	100
When at work, I really feel like I belong.	65	12	66	10	70	100
I seem to "connect" with others in my work group.	71	8	72	8	76	100
I am well-accepted by my co-workers.	76	5	81	3	87	100
I receive honest, meaningful feedback from my colleagues.	55	30	-	-	73	75
I receive feedback from my colleagues in a timely manner.	60	11	-	-	61	75
People at Fresno State own responsibility for their behaviors and actions.	53	18	-	-	53	50
People at Fresno State demonstrate compassion and concern.	61	12	-	-	61	75
California State University, Fresno Custom Statements - Average	65	10	72	8	71	81
Overall Survey Average 1 - 76	62	14	66	12	66	76
Overall Survey Average 1 - 60	61	14	63	13	64	74

Figure 5. 2019 Workplace Quality Survey

-Data source: ModernThink LLC



California State University, Fresno
UNIVERSITY-WIDE PEER EVALUATION FORM
Department of Plant Science

Professor Evaluated:_____

Rank:_____ **Course:**_____ **Term/Year:**_____

Date of Classroom Visitation:_____

Name of Evaluator_____ **Signature:**_____

Ratings Scale: 5 = superior | 4 = above average | 3 = average | 2 = below average | 1 = weak

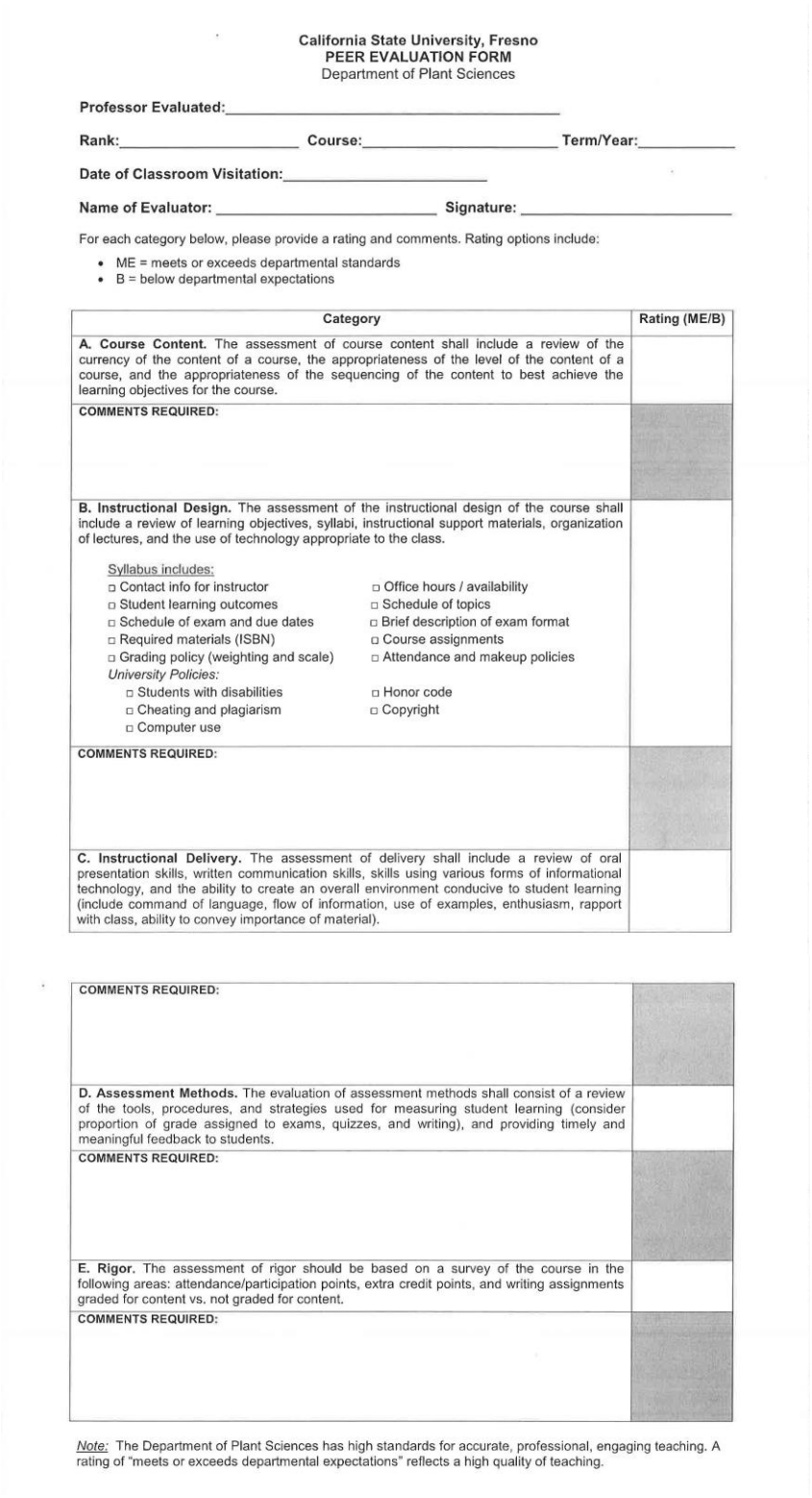
Category	Rating (1-5)
A. Course Content. The assessment of course content shall include a review of the currency of the content of a course, the appropriateness of the level of the content of a course, and the appropriateness of the sequencing of the content to best achieve the learning objectives for the course.	
COMMENTS:	
B. Instructional Design. The assessment of the instructional design of the course shall include a review of learning objectives, syllabi, instructional support materials, organization of lectures, and the use of technology appropriate to the class.	
COMMENTS:	
C. Instructional Delivery. The assessment of delivery shall include a review of oral presentation skills, written communication skills, skills using various forms of informational technology, and the ability to create an overall environment conducive to student learning.	
COMMENTS:	
D. Assessment Methods. The evaluation of assessment methods shall consist of a review of the tools, procedures, and strategies used for measuring student learning, and providing timely and meaningful feedback to students.	
COMMENTS:	

Additional comments may be included on the reverse side of this form.

APM322c

Approved Oct 14, 2011

Figure 6a. Existing peer evaluation form for the Department of Plant Science.



California State University, Fresno
PEER EVALUATION FORM
Department of Plant Sciences

Professor Evaluated:_____

Rank:_____ **Course:**_____ **Term/Year:**_____

Date of Classroom Visitation:_____

Name of Evaluator: _____ **Signature:** _____

For each category below, please provide a rating and comments. Rating options include:

- ME = meets or exceeds departmental standards
- B = below departmental expectations

Category	Rating (ME/B)
A. Course Content. The assessment of course content shall include a review of the currency of the content of a course, the appropriateness of the level of the content of a course, and the appropriateness of the sequencing of the content to best achieve the learning objectives for the course.	
COMMENTS REQUIRED:	
B. Instructional Design. The assessment of the instructional design of the course shall include a review of learning objectives, syllabi, instructional support materials, organization of lectures, and the use of technology appropriate to the class. Syllabus includes: □ Contact info for instructor □ Student learning outcomes □ Schedule of exam and due dates □ Required materials (ISBN) □ Grading policy (weighting and scale) □ Office hours / availability □ Schedule of topics □ Brief description of exam format □ Course assignments □ Attendance and makeup policies *University Policies:* □ Students with disabilities □ Cheating and plagiarism □ Computer use □ Honor code □ Copyright	
COMMENTS REQUIRED:	
C. Instructional Delivery. The assessment of delivery shall include a review of oral presentation skills, written communication skills, skills using various forms of informational technology, and the ability to create an overall environment conducive to student learning (include command of language, flow of information, use of examples, enthusiasm, rapport with class, ability to convey importance of material).	
COMMENTS REQUIRED:	
D. Assessment Methods. The evaluation of assessment methods shall consist of a review of the tools, procedures, and strategies used for measuring student learning (consider proportion of grade assigned to exams, quizzes, and writing), and providing timely and meaningful feedback to students.	
COMMENTS REQUIRED:	
E. Rigor. The assessment of rigor should be based on a survey of the course in the following areas: attendance/participation points, extra credit points, and writing assignments graded for content vs. not graded for content.	
COMMENTS REQUIRED:	

Note: The Department of Plant Sciences has high standards for accurate, professional, engaging teaching. A rating of "meets or exceeds departmental expectations" reflects a high quality of teaching.

Figure 6b. Proposed peer evaluation form for the Department of Plant Science.

COVID-19 response: As we are all aware, this pandemic uprooted most all of what we have considered safe and effective pedagogy. Even those that had already adapted to online instruction (partially or fully) were entirely unprepared for this unprecedented crisis, and subsequent transition to virtual instruction (not online learning). The ongoing health, economic, and housing uncertainties have necessarily taken center stage, requiring our department's students, staff and faculty to at best, simply "*adapt and overcome*". Any efforts to "*mitigate its impact*" were in the best circumstances, still largely triage, responding to weekly, daily and even hourly changes. We were; however, able to reaffirm that our team is a resilient lot, our students, staff and faculty adapted as best as possible over the past several months, and perhaps learned a few lessons on how we might increase efficiency, student access etc. in the future, including post-pandemic. This includes the obvious use of virtual technology (ZOOM, CAMTASIA, etc.), but also highlights our team's existing core value that we are here for our students. The department remains committed to our mission "*to ensure our students graduate with the skills and knowledge necessary to become leaders in modern, scientifically based, economically and environmentally sound agriculture*", no matter the challenges known, and unknown that lie ahead.

Faculty/Staff: The department maintains a diverse array of discipline-specific tenured/tenure track, and full time lecturer expertise (Table 1), and continues to enlist the expertise of part time lecturers to ensure program delivery as needed (Table 2). Our Ag One development team is actively seeking external support for the hiring of a much needed full time faculty with expertise in Soil Microbiology or Agroecology. New faculty continue to actively participate in the invaluable JORDAN 101 sessions, and these serve as the primary source of information. Faculty and staff also participate in various on-campus Professional Development Opportunities offered by the campus' "Organizational Excellence" team within the Division of Administrative Services.

Full Time Faculty	Expertise
Sharon Benes, Ph.D.	Soil Science
Gurreet Brar, Ph.D.	Pomology
John Bushoven, Ph.D.	Horticulture
Florence Cassel S., Ph.D.	Irrigation Science
Margaret Ellis, Ph.D.	Plant Pathology
Dave Goorahoo, Ph.D.	Olericulture
Jacob Hurst, M.Sc.	Plant Health
Christopher McKenna, M.A	Mechanized Agriculture
Ranjit Riar, Ph.D.	Agronomy
Vacant, Ph.D.	Weed Science
Jacob Wenger, Ph.D.	Economic Entomology
John Williams, M.A.	Mechanized Agriculture

Table 1. Full-time faculty expertise in the Department of Plant Science

Part Time Faculty	Course(s) Taught
Jill Hendrickson, M.F.A.	Plant 110W –Dimensions in Agriculture
Robert Roy, M.Sc.	Plant 105 – Food, Society and Environment
Richard Stoltz, M.Sc.	PLANT 30 – Introduction to Fruit Science, PLANT 165 - Pesticides
Ron Nishinaka, M.A.	PLANT 40 – Introduction to Ornamental Horticulture
Jennifer Tweedy, M.A.	PLANT 41 – Floral Design
Don Vasconcellos, M.Sc.	Plant 105 – Food, Society and Environment
Maria Estrada, M.Sc.	Plant 150 – Crop Improvement, Plant 105 - Food, Society Environment, Plant 99 - Introduction to Biometrics
Charles Krauter, Ph.D.*	PLANT 71 - Agricultural Water

Table 2. Department of Plant Science part-time faculty for the 2019-20 AY

* *Emeritus faculty*

Research Activity: The faculty of the Department of Plant Science all remain very active in research with either internal (ARI), or external (Commodity Boards, CDFA, USDA, Industry, etc.) funding (Table 3). These data do not include the substantial in-kind support faculty receive each year. The department faculty actively engage undergraduate and graduate students, exchange students, and visiting scholars in all research activities, supported by in large part by a combination of funding sources (e.g. Fresno State Undergraduate Research Awards, Harvey Jordan Fellowships, and externally funded Grants/Contracts, etc.). Research conducted by the department faculty continues to span a diverse array of disciplines relevant to California Agriculture (Table 4).

	2013-2014		2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020	
	Requested	Received	Requested	Received	Requested	Received	Requested	Received	Requested	Received	Requested	Received	Requested	Received
Federal $	221,145	8,000	424,154	26,504	493,779	154,736	669,383	292,246	256,115	71,116	458,235	40,0000	376,580	64,920
State $	239,919	26,665	800,101	107,393	1,878,962	246,552	1,899,573	703,329	722,497	310,595	1,209,815	612,794	659,310	311,157
Private $	208,160	208,160	139,778	0	150,688	10,910	155,786	122,668	301,785	21,526	292,460	175,458	228,970	87,311
Total $	669,224	242,825	1,364,033	133,897	2,523,429	412,198	2,724,742	1,118,243	1,280,397	403,237	1,960,510	828,252	1,264,861	436,388

Table 3. Research funds requested-received by the Department of Plant Science faculty for the past seven (7) years. Funds requested/received do not include in-kind match or proposals under review at time of reporting - *Data source: Division of Research and Graduate Studies*

Orchard Crop Production	Nitrogen Leaching
Salinity Tolerance	Plant Tissue Culture
Irrigation	Nitrogen Use Efficiency
Vegetable Production	Organic Production Systems
Weed Ecology and Management	Pesticides
Soil Quality	Entomology
Propagation	Conservation Tillage
Water Use Efficiency	Crop Yield Management
Plant Disease	Root Development
Dormancy	Plant Disease

Table 4. Research topics addressed by department faculty in AY 2019-20.

2019-20 Faculty/Student Research Presentations:

1. Black A*§, A. Garcia*, J. Robles, F. Cassel S. and D. Goorahoo. 2020. Evaluating Nitrate Leaching Potential for Broccoli Grown in a Sandy Loam Soil. JCAST Honors Program 5th Cohort Presentations. California State University, Fresno. May 4th 2020. (§Medal Recipient).
2. Boots-Haupt*, L., Riar, R., Brasier,. K., and H. Zakeri. (2019) Evaluating Biological Nitrogen Fixation of Different Faba Bean (Vicia faba L.) Cultivars. ASA-CSSA-SSSA Annual Meeting, Nov. 9-13, 2019, San Antonio, TX
3. Boots-Haupt*, L., Riar, R., Brasier,. K., and H. Zakeri. (2020) Evaluating Biological Nitrogen Fixation of Different Faba Bean (Vicia faba L.) Cultivars. 41st Annual Central California Research Symposium, Accepted March 2020. Event cancelled due to Covid-19. Abstract # 250
4. Boots-Haupt*, L., Riar, R., Brasier,. K., and H. Zakeri. (2020) Evaluating Biological Nitrogen Fixation of Different Faba Bean (Vicia faba L.) Cultivars. California Plant and Soil Conference, Feb. 5, 2020, Fresno, CA
5. Brar R K.* §, T. Frnzyan*, L. Reyes-Solorio*, F. Cassel S., T. Jacobson, C. Muraka*, K. Steinhauer, J. Robles, A. Venegas*, D. Goorahoo, A. Mele*, and A. Garcia*. 2019. Comparing yield and water use efficiency of drip and deficit drip irrigated sorghum (Sorghum bicolor) and corn (Zea mays) subjected to varying nitrogen fertilizer rates. FREP conference, Fresno, CA. Oct 2019. (§Received 2nd place award for graduate student poster presentation)
6. Brar R K.*, T. Frnzyan*, L. Reyes-Solorio*, F. Cassel S., T. Jacobson, C. L. Muraka*, K. Steinhauer*, J. Robles, A. Venegas*, D. Goorahoo D., A. Mele*, A. Garcia*. 2020. Comparing yield, nutritional quality, water and nitrogen use efficiencies of deficit drip and flood irrigated sorghum (Sorghum bicolor) and corn (Zea mays) subjected to different nitrogen rates. Accepted for oral presentation at the 2020 International Nitrogen Initiative (INI2020) Conference scheduled for May 4th -7th 2020 in Berlin, Germany. Conference postponed to 2021 due the COVID 19 Pandemic restrictions.
7. Brar R. K.*, V. Saldena*§, L. Reyes-Solorio*, C. Muraka*, T. Frnzyan*, F. Cassel S., T. Jacobson, K. Steinhauer*, J. Robles, A. Venegas*, D. Goorahoo, and A. Garcia*. 2019. Evaluating water use efficiency of corn and sorghum irrigated under drip and flood irrigation in a sandy loam soil. IA conference, Las Vegas, NV. Dec. 4- 7th 2019. (§Received 2nd place award for undergraduate student poster presentation)
8. Brar R.K.*, T. Frnzyan*, L. Reyes-Solorio*, F. Cassel S., T. Jacobson, C. Muraka*, K. Steinhauer*, J. Robles, A. Venegas*, D. Goorahoo, A. Mele*, and A. Garcia*. 2019. Comparing yield and water use efficiency of drip and deficit drip irrigated sorghum (Sorghum bicolor) and corn (Zea mays) subjected to

varying nitrogen fertilizer rates. Third ARI PI meeting, Sacramento, CA. Oct. 25th 2019.

9. Brar R.K.*§, T. Frnzyan*, L. Reyes-Solorio*, C. Muraka*, K. Steinhauer*, J. Robles, A. Venegas*, A. Garcia*, T. Jacobsen, D. Goorahoo, and F. Cassel S. 2020. Response of furrow, drip, and deficit drip-irrigated sorghum (Sorghum bicolor) to varying nitrogen rates, in comparison with corn (Zea mays). Annual meetings, California Chapter of the Am. Soc. of Agronomy, Fresno, CA (Feb 4-5). (§Received 2nd place award for graduate student poster presentation).
10. Cassel S. F., J. Samano-Monroy* and D, Goorahoo. 2020. Nitrate Leaching Potential for Drip Irrigated Cauliflower (Brassica oleracea var. Botrytis) Grown on a Sandy Loam Soil. Accepted for poster presentation at the 2020 International Nitrogen Initiative (INI2020) Conference scheduled for May 4th -7th 2020 in Berlin, Germany. Conference postponed to 2021 due the COVID 19 Pandemic restrictions.
11. Cassel S. F., S. Ashkan, T. Thao*, T. Wang, F. Melton, A. Mele*, A. Garcia*, D. Goorahoo, J. Robles, R. Hutmacher, and L. Johnson. 2019. Developing crop coefficient (Kc) for sub-surface drip irrigated onions (Allium cepa) using weighing lysimeter and fractional ground cover (Fc). Third ARI PI meeting, Sacramento, CA. Oct. 25th 2019.
12. Cassel S., F., O. Flores*, J. Cardona*, L. Reyes Solorio*, T. Frnzyan*, P. Yadav, J. Robles, and D. Goorahoo. 2019. Soil sensor and climate based technology to improve irrigation efficiency in vegetables. IA conference, Las Vegas, NV. Dec. 4- 7th 2019
13. Diaz, J.*, Hutmacher, R.B., and Ellis, M.L. 2019. Study of potential interactions between two cotton pathogens, Fusarium oxysporum f. sp. vasinfectum and Rhizoctonia solani. California Plant and Soil Conference. Fresno, CA, USA. February 5-6, 2019.
14. Diaz, J.*, Hutmacher, R.B., Ulloa, M., and Ellis, M.L. 2019. Phenotypic and genotypic characterization of Fusarium oxysporum f. sp. vasinfectum isolates as seedling and wilt disease pathogens of cotton. California Plant and Soil Conference. Fresno, CA, USA. February 5-6, 2019.
15. Ellis, M.L., Diaz, J.*, Garcia, J.*, Lara, C.*, Hutmacher, R.B., Ulloa, M., and Nichols, R.L. 2020. Genotypic evaluation of current field populations of Fusarium oxysporum f. sp. vasinfectum isolates from California. Proceedings of the Beltwide Cotton Conference. National Cotton Council of America, Austin, LTX.
16. Ellis, M.L., Diaz, J.*, Hutmacher, R.B., and Ulloa, M. 2019. Disease development in cotton when co-inoculated with the soil borne fungi Fusarium oxysporum f. sp. vasinfectum race 4 and Rhizoctonia solani. Plant Health. Cleveland, OH. August 4-5, 2019.
17. Ellis, M.L., Diaz, J.*, Hutmacher, R.B., and Ulloa, M. 2019. Evaluation of Fusarium oxysporum f. sp. vasinfectum race 4 as a seedling pathogen and in co-

inoculation assays with Rhizoctonia solani. Pages 349-353 in: Proceedings of the Beltwide Cotton Conference. National Cotton Council of America, New Orleans, LA.

18. Ellis, M.L., Diaz, J.*, Hutmacher, R.B., and Ulloa, M. 2019. The past and current impact of Fusarium oxysporum f. sp. vasinfectum race 4 on cotton production in California. Pages 717-717 in: Proceedings of the Beltwide Cotton Conference. National Cotton Council of America, New Orleans, LA.
19. Ellis, M.L., Diaz, J.*, Hutmacher, R.B., and Ulloa, M. 2019.Genotypic and phenotypic evaluation of Fusarium oxysporum f. sp. vasinfectum race 4 isolates collected from cotton in California. Plant Health. Cleveland, OH. August 4-5, 2019.
20. Garcia A.*, N. Toribio*, A. Solorio*, J. Robles, B. Sethuramasamyraja, F. Cassel S., and D. Goorahoo. 2020. Fertigation strategy for optimizing water and nitrogen use efficiency in processing tomatoes grown on a sandy loam soil. Annual meetings, California Chapter of the Am. Soc. of Agronomy, Fresno, CA (Feb 4-5).
21. Garcia, A. *, N. Toribio*, A. Solorio*, J. Robles, B. Sethuramasamyraja, D. Goorahoo, and F. Cassel S. 2019. Assessing fertigation strategies for nitrogen use efficiency (NUE) and soil nitrate levels in processing tomatoes. IA conference, Las Vegas, NV. Dec. 4- 7th 2019.
22. Garcia, A.*, B. Sethuramasamyraja, D. Goorahoo, and F. Cassel S. 2019. Soil monitoring and fertigation strategies for mitigating nitrate leaching in tomato production. 33rd West Indies Agricultural Economic Conference Caribbean Agro-Economic Society, Tobago (Aug 4-9).
23. Garcia, J.*, Lara, C.*, Diaz, J.*, Hutmacher, R.B., Ulloa, M., Nichols, R.L., and Ellis, M.L. 2020. Genotypic characterization of Fusarium oxysporum f. sp. vasinfectum isolates from current field populations in California. California Plant and Soil Conference. Fresno, CA, USA. February 4-5, 2020.
24. Goorahoo D., F. Cassel S., C.L Muraka*, A. Unc, and G. Seepersad. 2020. Optimizing Water and Nitrogen Use Efficiency (WUE & NUE) with Airjection® Irrigation. Accepted for oral presentation at the 2020 International Nitrogen Initiative (INI2020) Conference scheduled for May 4th -7th 2020 in Berlin, Germany. Conference postponed to 2021 due the COVID 19 Pandemic restrictions.
25. Goorahoo, D., F. Cassel S., and G. Seepersad. 2019. Economic and environmental benefits of Airjection® irrigation. 33rd West Indies Agricultural Economic Conference Caribbean Agro-Economic Society, Tobago (Aug 4-9).
26. Goorahoo, D., F. Cassel S., P. Yadav, T. Thao*, A. Mele*, A. Garcia*, J. Robles, L. Reyes-Solorio*, and T. Frnzyan*. 2019. Evapotranspiration and soil sensor-based technology to improve irrigation and water use efficiency in vegetables. Third ARI PI meeting, Sacramento, CA.

27. Kang, G*., and R. Riar. (2020) Interaction of Salinity and Gibberellic Acid on Cotton Growth and Yield 41st Annual Central California Research Symposium, Accepted March 2020. Event cancelled due to Covid-19. Abstract # 50 at
28. Lake, J.*, Ellis, M.L., and Michailides, T.J. 2019. Physiological changes in conidia of the fungal pathogen Neofusicoccum mediterraneum when exposed to desiccation. Plant Health. Cleveland, OH. August 4-5, 2019.
29. Muraka C. *, T. Frnzyan*, L. Reyes-Solorio*, A. Venegas*, A. Mele, K. Steinhauer*, A. Garcia*, L. Dejean, F. Cassel S., and D. Goorahoo. 2019. Quantifying the oxidative stress in tomatoes subjected to Airjection® irrigation. Third ARI PI meeting, Sacramento, CA. Oct. 25th 2019.
30. Reyes-Solorio, L.*, T. Frnzyan*, A. Garcia*, N. Toribio*, A. Solorio*, C. Muraka*, J. Robles, B. Sethuramasamyraja, F. Cassel S., and D. Goorahoo. 2020. Evaluating the effects of various irrigation and nitrogen application methods on the yield and quality of processing tomatoes. Annual meetings, California Chapter of the Am. Soc. of Agronomy, Fresno, CA (Feb 4-5).
31. Reyes-Solorio, L.*, T. Frnzyan*, A. Mele*, F. Cassel S., D. Goorahoo, C. Cochran*, and J. Robles. 2019. Nitrogen use efficiency and water use efficiency of automated drip irrigated tomatoes subjected to four fertilizer rates. IA conference, Las Vegas, NV. Dec. 4- 7th 2019.
32. Riar, R., Boots-Haupt*, L.Brasier,. K., and H. Zakeri.(2019) Evaluation of Different Faba Bean (Vicia faba L.) Cultivars As a Cover Crop ASA-CSSA-SSSA Annual Meeting, Nov. 9-13, 2019, San Antonio, TX
33. Robles J., A. Mele*, D. Goorahoo, F. Cassel S., P. Yadav, T. Thao*, C. Cochran*, A. Garcia*, L. Reyes-Solorio*, and T. Frnzyan*. 2019. Nitrogen use efficiency and water use efficiency of broccoli irrigated with evapotranspiration- and soil sensor- based scheduling technology. Third ARI PI meeting, Sacramento, CA. Oct. 25th 2019.
34. Robles, J., C. Cochran*, F. Cassel S., and D. Goorahoo. 2019. Optimizing nitrogen and water use Efficiency in lettuce production. 33rd West Indies Agricultural Economic Conference Caribbean Agro-Economic Society, Tobago (Aug 4-9).
35. Sharon E. Benes*, DH Putnam, Singh Simarjeet, Galdi Giuliano, Anderson Aaron, and RB Hutmacher (2019) Field Trials Evaluating Salinity Tolerance in Alfalfa (Medicago Sativa L.): how to deal with spatial variability in the salinity imposed? Agricultural Research Institute Annual PI Meetings, Oct. 25, 2019, Hyatt Regency, Sacramento, CA.
36. Singh Simarjeet*, SE Benes, DH Putnam, RB Hutmacher, and F Cassel (2019) Response of Alfalfa Cultivars to Saline, Subsurface Drip Irrigation: Uniformity of salinity Imposed & spatial analysis between drip lines and amongst variety plots. 2019 ASA-CSSA-SSSA International Annual Meetings, Nov. 9-13, 2019, San Antonio, TX.

37. Singh Simarjeet*, SE Benes, DH Putnam, RB Hutmacher, and F Cassel (2019) Response of Alfalfa Cultivars to Saline, Subsurface Drip Irrigation: Uniformity of salinity Imposed & spatial analysis between drip lines and amongst variety plots. 2019 Western Alfalfa & Forage Symposium, Nov. 19-21, Grand Sierra Resort, Reno, NV.
38. Singh Simarjeet*, SE Benes, DH Putnam, RB Hutmacher, Isaya Kisekka and F Cassel (2019) Response of Alfalfa Cultivars to Saline, Subsurface Drip Irrigation: Uniformity of salinity Imposed & spatial analysis between drip lines and amongst variety plots. California Plant & Soil Conference, Feb 4-5, 2020, DoubleTree Hiton, Fresno, CA.
39. Singh, H*., Khezri, M., Bushoven, J., Yelton, M., Brar G. (2019) Overcoming citrus nursery growth issues by using Smart Lighting with Different Photoperiods. ASHS Annual Meetings, Las Vegas, NV
40. Singh, H*., Bushoven, J., Benes, S., and G. Brar 2020 (2020)Different Photoperiod Regimes with LED Lighting Influence Growth of Container Grown Budded and Non-budded Citrus Nursery Trees. California Plant & Soil Conference, Feb 4-5, 2020, DoubleTree Hiton, Fresno, CA.
41. Steinhauer K. *, J. Robles, D. Goorahoo, F. Cassel S., P. Yadav, A. Garcia*, L. Reyes-Solorio*, T. Frnzyan*. 2019. Automated irrigation using weather and sensor data for optimizing broccoli production. IA conference, Las Vegas, NV. Dec. 4- 7th 2019.
42. Syverson, D*., Khezri, M., Bushoven, J., Ferguson, L., Brar, G. (2019) Efficacy trials of dormancy breaking treatments in pistachio. CA Plant and Soil Meeting, American Society of Agronomy, Fresno, CA.
43. Syverson, D*., Khezri, M., Ferguson, L., Brar, G. (2019) Late Dormancy Application of Ethephon and GA3 Affect Bud Respiration and Bloom Uniformity in Pistachios. ASHS Annual Meetings, Las Vegas, NV
44. To, M.*, Westphal, A., Wenger, J.A., and Ellis, M.L. 2020 Development of a DNA extraction method from epidemiologically meaningful amounts of soil for quantification of nematodes using quantitative PCR. California Plant and Soil Conference. Fresno, CA, USA. February 4-5, 2020. (§Received 1st place award for graduate student poster presentation)
45. Ulloa, M., Hutmacher, R.B., Ellis, M.L., and Nichols, R.L. 2019. Diagnosis of Fusarium oxysporum f. sp. vasinfectum race 4 symptoms in Pima and Upland cotton cultivars. Page 714 in: Proceedings of the Beltwide Cotton Conference. National Cotton Council of America, New Orleans, LA.
46. Ulloa, M., Hutmacher, R.B., Frigulti, T.L.*, Ellis, M.L., Nichols, R.L., Saha, S., Stelly, D.M., Roberts, P.A. 2019. Experiences in breeding for FOV4 resistance/tolerance in Upland and molecular breeding opportunities. Page 215 in: Proceedings of the Beltwide Cotton Conference. National Cotton Council of America, New Orleans, LA.

47. Vizcarra, A*., Yeasmin, D., Bushoven, J.T. and C. Krauter (2020) The Hidden Half - Use of Ground Penetrating Radar in Assessing Tree Root Architecture, CA Plant and Soil Meeting, American Society of Agronomy, Fresno, CA
48. Woods, T., and G. Brar (2019) Interaction of the Plant Growth Regulator, AVG, with Varying Nitrogen Application Rates in Relation to Yield and Quality in Almonds. ASHS Annual Meetings, Las Vegas, NV

Financial Management: The department has several accounts used to directly support its teaching, research and outreach missions (Table 5). Department staff and faculty are closely monitoring use of collected course fees within each semester, and have made significant improvements to use of such for required expendable laboratory supplies and equipment. New laboratory fees proposals have been submitted, and are currently at the university-level for approval and potential implementation in the latter part of the 2020-21 AY.

Account #	Account Name	July 1, 2016	May 30, 2017	May 30, 2018	May 30, 2019	May 30, 2020	Primary uses
30175	Annual Fund-Plant Science	3,922	3,982	3,198	1,388	356	General department support
32435	Plant Science & Mech Agric	22,233	16,868	15,543	24,853	27,437	FFA, supplies, travel, CAPCA, com.rel., recruitment, etc.
300052	Gar Tootelian Fdn-Plant Health	11,477	7,947	1,470	504	504	Travel, com. rel., year-end banquet, awards, misc.
300340	Plant Science Soil Team	3,077	4,986	1,419	2,455	922	Travel, lodging, registration, supplies
32266	Plant Science - Indirect Return	7,147	8,122	8,259	8,137	8,137	General support for research
46724	OH & CRSC	-	7,209	4,059	4,262	6,025	Misc. course fees for PLANT 41 and 123
46746	MeAg	-	140	3,794	6,001	828	Misc. course fees for MeAg 1 and MeAg 50

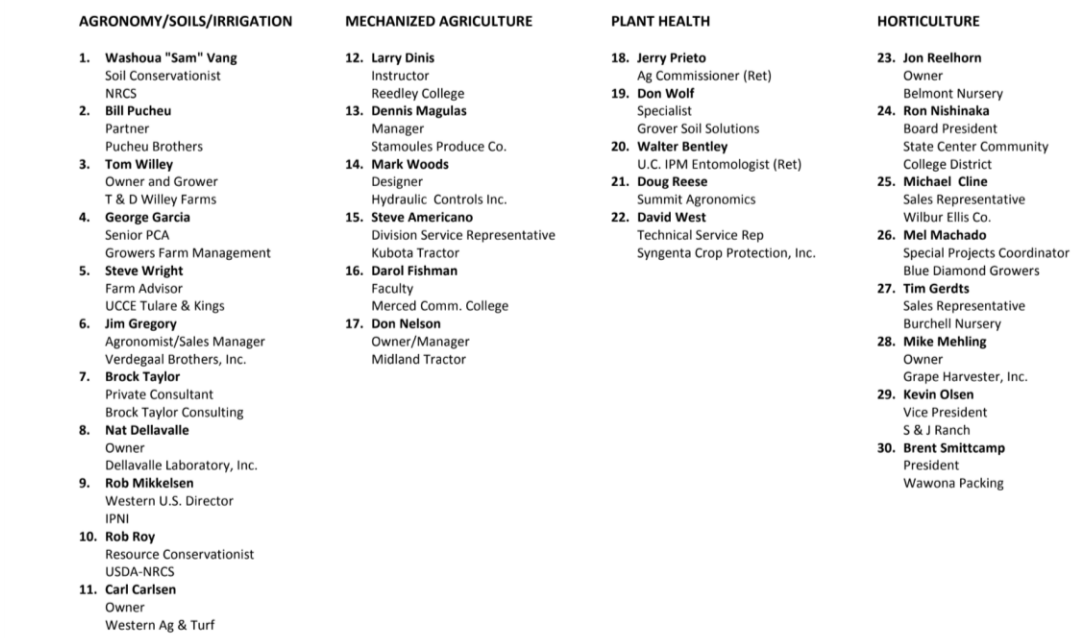
Table 5. Accounts currently managed by the Department of Plant Science (rounded to nearest dollar) - *Data Source Foundation Financial Services*

Broadening and deepening relationships with external audiences:

In collaboration with the Ag One development team, the department continues to focus on the following areas:

- Strengthening its Mechanized Agriculture emphasis due in large part to the Moller family support. The Mechanized Agriculture shops and equipment have improved considerably in the past two years, and discussion regarding continued support is ongoing.
- Providing "needs assessment' for use in preliminary discussions with external supporters to upgrade the college's Horticulture Unit.
- Securing external support for a new faculty hire, and instructional support technician with expertise in Organic Production Systems. (Note; this has since changed from a certificate to a minor).
- Renewing the Bayer Crop Science Graduate Student Fellowship

Department of Plant Science Advisory Board: There remains interest in re-envisioning the department's existing advisory board in cooperation with the Ag One Development team (Figure 7). The current advisory board has not met as a full group in many years; however, the membership (in addition to the *de facto* group listed below) have individually, or in smaller groups been instrumental in providing insight to the department on curricular, research, and development efforts. The Mechanized Agriculture sub-committee was instrumental in demonstrating a state-wide need for a robust Mechanized Agriculture Program in the Jordan College, with specific emphasis that such should not be an Agricultural Engineering, or an Industrial Technology orientated program. This group also demonstrated compelling evidence for a need to hire a second Mechanized Agriculture lecturer left vacant since Dr. Alexandrou's permanent transfer to the Department of Industrial Technology. The Plant Health sub-committee membership is being re-evaluated as faculty within the discipline are forming new and significant partnerships with members of the Department of Pesticide Regulation, CA Association of Pest Control Advisers, Bayer Crop Science, Syngenta, Commodity Boards, etc. Membership in this latter group is being identified to better represent the Plant Health industry (corporate, governmental, and research). The Horticulture sub-committee restructuring remains in process as Dr. Brar establishes his teaching and research program. Members of this latter group will be essential for the department's efforts to garner internal and external support to update the much outdated controlled environment facilities (Hort Unit). With the hiring of the new agronomist Dr. Riar, and the appointment of Dr. Benes as the J.G. Boswell Endowed Chair in Plant Science, Agronomy/Soils/Irrigation sub-committee will likely undergo some membership changes to better reflect the current industry needs.



AGRONOMY/SOILS/IRRIGATION

1. **Washoua "Sam" Vang**
   Soil Conservationist
   NRCS
2. **Bill Pucheu**
   Partner
   Pucheu Brothers
3. **Tom Willey**
   Owner and Grower
   T & D Willey Farms
4. **George Garcia**
   Senior PCA
   Growers Farm Management
5. **Steve Wright**
   Farm Advisor
   UCCE Tulare & Kings
6. **Jim Gregory**
   Agronomist/Sales Manager
   Verdegaal Brothers, Inc.
7. **Brock Taylor**
   Private Consultant
   Brock Taylor Consulting
8. **Nat Dellavalle**
   Owner
   Dellavalle Laboratory, Inc.
9. **Rob Mikkelsen**
   Western U.S. Director
   IPNI
10. **Rob Roy**
    Resource Conservationist
    USDA-NRCS
11. **Carl Carlsen**
    Owner
    Western Ag & Turf

MECHANIZED AGRICULTURE

12. **Larry Dinis**
    Instructor
    Reedley College
13. **Dennis Magulas**
    Manager
    Stamoules Produce Co.
14. **Mark Woods**
    Designer
    Hydraulic Controls Inc.
15. **Steve Americano**
    Division Service Representative
    Kubota Tractor
16. **Darol Fishman**
    Faculty
    Merced Comm. College
17. **Don Nelson**
    Owner/Manager
    Midland Tractor

PLANT HEALTH

18. **Jerry Prieto**
    Ag Commissioner (Ret)
19. **Don Wolf**
    Specialist
    Grover Soil Solutions
20. **Walter Bentley**
    U.C. IPM Entomologist (Ret)
21. **Doug Reese**
    Summit Agronomics
22. **David West**
    Technical Service Rep
    Syngenta Crop Protection, Inc.

HORTICULTURE

23. **Jon Reelhorn**
    Owner
    Belmont Nursery
24. **Ron Nishinaka**
    Board President
    State Center Community
    College District
25. **Michael Cline**
    Sales Representative
    Wilbur Ellis Co.
26. **Mel Machado**
    Special Projects Coordinator
    Blue Diamond Growers
27. **Tim Gerdts**
    Sales Representative
    Burchell Nursery
28. **Mike Mehling**
    Owner
    Grape Harvester, Inc.
29. **Kevin Olsen**
    Vice President
    S & J Ranch
30. **Brent Smittcamp**
    President
    Wawona Packing

Figure 7. 2019-20 AY Department of Plant Science Advisory Board Membership

The department also continues to enlist the expertise of the following external personnel as graduate thesis committee members and/or research collaborators (note: these also serve as the department's *de facto* advisory experts as needed):

- Andreas Westphal, Ph.D, UC ANR
- Anthony Mucciardi, Ph.D., TreeRadar Inc.
- Brian Duggan, Ph.D., Davren Global
- Charles Burks, Ph.D., USDA-ARS
- Chris Wallis, Ph.D., USDA-ARS
- Dan Putnam, Ph.D., UC ANR
- Dave Cheetham, M.Sc., Helena Agri-Enterprises
- David Grantz, Ph.D., UC ANR
- Elaine Backus, Ph.D., USDA-ARS
- Gary Banuelos, Ph.D., USDA-ARS
- Giulia Marino, Ph.D., UCCE
- Houston Wilson, Ph.D., UC ANR
- Jeffery A. Dahlberg, UC ANR
- Jeffrey Mitchell, Ph.D. UC ANR
- Jeremy Bahne, M.Sc., Burchell Nursery
- Joseph Smilanick, Ph.D., USDA-ARS
- Kent Danne, Ph.D, UC ANR
- Kurt Hembree, M.Sc. UCANR
- Kyle Brasier, Ph.D., CSU Chico

- Louis Holloway, M.Sc. , Bayer CropScience
- Louise Ferguson, Ph.D., UC ANR
- Masood Khezri, Ph.D., MR Research Institute
- Mauricio Ulloa Ph.D., USDA-ARS
- Rachel Naegele, Ph.D., USDA-ARS
- Robert Hutmacher, Ph.D., UCCE
- Sebastian Saa, Ph.D., Almond Board of California
- Steven Wright, M.Sc., UCCE
- Themis J Michailides Ph.D., UC ANR

2019-20 AY

Department of Plant Science

Committee-Organization Representatives

Department Level	
Undergraduate Program Committee	Goorahoo, Ellis, Cassel S.. McKenna
Undergraduate Program Outcomes Assessment Coordinator	Cassel S.
Graduate Program Coordinator	Benes
Graduate Program Committee	Benes, Brar, and Wenger
GE Coordination (Plant 105)	Goorahoo
RTP Review Committee	Bushoven, Shrestha, Rocca
Soil Judging Team Faculty Adviser	Goorahoo
Plant Science Club Faculty Adviser	Goorahoo
Plant Health Society Faculty Adviser	Ellis
MeAg Advisory Board Faculty Liaison	Williams/McKenna
Horticulture Advisory Board Faculty Liaison	Brar, Bushoven, Goorahoo
Soils, Agronomy, Irrigation Advisory Board Faculty Liaison	Benes, Cassel S., Riar
Plant Health Advisory Board Faculty Liaison	Ellis, Wenger
Resnick Lecturer Search Committee	Ellis, Wenger, and Benes
Jordan College Level	
Budget and Resources	Goorahoo
Research, Scholarly and Creative Activities	Benes
Personnel	Benes
Academic Programs	Cassel S.
University Farm Laboratory	Williams
Faculty Executive Committee	Riar
Jordan Agricultural Research Center Committee	Wenger
Jordan Honors Council	Ellis
Jordan College International Programs Taskforce	Ellis
FFA Faculty Adviser - Agricultural Mechanics	Williams/McKenna
FFA Faculty Adviser - Nursery/Landscape	Bushoven/Nishinaka
FFA Faculty Adviser - Agronomy	Riar
FFA Faculty Adviser - Cotton	Ellis
FFA Faculty Adviser - Citrus	Brar
FFA Faculty Adviser - Farm Power and Machinery	Williams
FFA Faculty Adviser - Small Engines	Williams
FFA Faculty Adviser - Agricultural Pest Control	Wenger
FFA Faculty Adviser - Citrus Judging	Brar/Stoltz
FFA Faculty Adviser - Fruit Tree Judging	Brar/Stoltz
FFA Faculty Adviser - Floriculture	Tweedy
FFA Faculty Adviser - Vegetable Crop Judging	Goorahoo
FFA Faculty Adviser - Soil and Land Evaluation	Benes

University Level	
Central California Research Symposium Committee	Benes
Faculty Search Equal Employment Opportunity Designee	Benes
Staff Search Equal Employment Opportunity Designee	Miyasaki
Campus Planning Committee	Bushoven
Arboretum Committee	Bushoven
Veterans and Military Services Committee	Bushoven
Omega Delta Sigma Faculty Adviser	Bushoven
Academic Policy & Planning Committee	Goorahoo
University Budget Committee	Cassel S.
University Water Cohort	Cassel S.
CSM Biotechnology PSM Faculty	Bushoven, Goorahoo
Master of Science in Water Resource Management Faculty	Benes, Goorahoo, Cassel S.
Academic Senator	Ellis/Brar
External Level	
California Chapter – American Society of Agronomy	Benes (Past President)
California Chapter – American Society of Agronomy	Cassel S. (Secretary/Treasurer)
Plant Growth Regulation Society of America	Brar (Vice President)
Westside Research and Extension Center, Research Advisory Committee	Cassel S., Benes
California Women for Agriculture	Miyasaki
Fresno County 4-H	Miyasaki
CSUPERB Faculty Consensus Group	Bushoven
CDFA FREP Technical Advisory Committee	Bushoven
CA Urban Forests Council	Bushoven
CA DPR APCAC	Ellis
CAPCA – Fresno State Liaison	Wenger
Clovis Botanical Garden Advisory Board	Bushoven
Plant Disease Journal - Notes Assigning Editor	Ellis
CDFA SCBGP Technical Review Committee	Brar
Journal of Plant Growth Regulation- Editorial Board	Brar
Saratoga Horticultural Research Endowment Committee	Bushoven
CATA San Joaquin Region President	Williams
CATA State Governing Board Member	Williams
California FFA Board of Directors	Williams
Madera South High School Ag Advisory Board Member	Williams
National and California Chapter - Farmer Veterans Coalition	Bushoven
Minarets High School Ag Advisory Board Member	McKenna

***Note**: This annual report was compiled completely digitally from remote offices; all interaction via virtual communication (email, ZOOM, text, and phone) thus may contain errors, omissions, or evidence (direct or otherwise) of a dedicated, well-oiled, but exhausted team. Onwards and upwards...*