

Annual Assessment Report for 2020-2021 AY

Reports completed on assessment activities carried out during the 2020-21 AY will be due September 30th 2021 and must be e-mailed to the Director of Assessment, Dr. Douglas Fraleigh (douglasf@csufresno.edu).

Provide detailed responses for each of the following questions within this word document. Please do NOT insert an index or add formatting. Furthermore, only report on two or three student learning outcomes even if your external accreditor requires you to evaluate four or more outcomes each year. Also be sure to explain or omit specialized or discipline-specific terms.

Department/Program: Plant Science Degree M.S.

Assessment Coordinator: Jacob Wenger

1. Please list the learning outcomes you assessed this year.

SLO 1.3: conduct scholarly review of primary literature and develop competency in interpreting existing data from scientific papers

SLO 2.1: plan and design experiments to test a specific hypothesis

SLO 4.1: communicate experimental procedures, results, and their conclusions in written format

SLO 4.2: present research findings in a scholarly manner through oral or poster presentation and be able to respond to questions integrating scholarly knowledge into the response.

2. What assignment or survey did you use to assess the outcomes and what method (criteria or rubric) did you use to evaluate the assignment? **Please describe the assignment and the criteria or rubric used to evaluate the assignment in detail and, if possible, include copies of the assignment and criteria/rubric at the end of this report.**

The four Student Learning Objectives we selected were evaluated using the thesis proposal and defense rubric. During the thesis defense, master's students present their written thesis proposal to their thesis committee. The proposal is submitted both as a written document (the proposal) and as an oral presentation. Following the presentation, the thesis committee has approximately two and a half hours to ask the student questions related to the proposed research and to the field of Plant Science (the defense). Both the written proposal and oral defense are assessed by each thesis committee member using a standardized departmental rubric. This document is then submitted to the graduate program coordinator. Students are evaluated on ten aspects of the written proposal and oral defense:

1. Definition of the problem (how clearly the research problem is stated)
2. Literature & previous work (the quality and thoroughness of the literature review)

3. Impact of proposed work (how the research fits within the field's broader context)
4. Approach (the experimental design of the thesis research)
5. Quality of written communication (quality of writing in the written proposal)
6. Quality of oral communication (quality of presentation and answers at the defense)
7. Critical thinking (evidence of critical thought in proposal and defense)
8. Broader impact (potential of research to influence plant science)
9. Overall quality of oral defense
10. Overall quality of written proposal

Each of these ten aspects is graded on a scale of 1 to 5 where 1 = unsatisfactory, 2 = marginal, 3 = satisfactory, 4 = very good, and 5 = outstanding. The committee then decides whether the body of work presented is sufficient for the student to pass (satisfactory or better in all categories), conditionally pass (satisfactory or higher in almost all categories, minor revisions requested before a full pass is issued), or fail (unsatisfactory in multiple categories). The student's oral defense and written proposal are assessed separately. Students who fail may be permitted to revise their written proposal and oral presentation then defend again at the committee's discretion.

3. What did you learn from your analysis of the data? Please include sample size (how many students were evaluated) and indicate how many students (number or percentage instead of a median or mean) were designated as proficient.

Thesis defense rubrics were collected for 10 students who defended their theses within the past 3 academic years. For each student the mean score was calculated for each of the ten rubric aspects. The final number was then rounded to an even number (in-line with the rubric scoring guide). A score of 3 or higher is considered satisfactory/proficient.

SLO 1.3: conduct scholarly review of primary literature and develop competency in interpreting existing data from scientific papers.

SLO 1.3 was evaluated using aspect 2 of the rubric "*Literature and previous work*". On average the ten students scored a **3.2 of 5 (s.d. 0.92)**, with 9 students scoring proficient or above and one student scoring below the proficient level.

SLO 2.1: plan and design experiments to test a specific hypothesis. SLO 2.1 was evaluated using aspect 4 of the rubric "*Approach*" which addresses the experimental design of the proposed work. On average the ten students scored a **3.6 of 5 (s.d. 1.07)**, with 8 students scoring proficient or above and 2 students scoring below the proficient level.

SLO 4.1: communicate experimental procedures, results, and their conclusions in written format.

SLO 4.1 was evaluated using aspect 5 of the rubric "*Quality of written communication*" and aspect 10 "*Overall quality of written proposal*". For aspect 5 the ten students had a mean score of **3.3 of 5 (s.d. 0.95)**, with 7 students scoring proficient or above and 3 students scoring below the proficient level. For aspect 10 the ten students had a mean score of **3.1**

of 5 (s.d. 0.99), with 8 students scoring proficient or above and 2 students scoring below the proficient level.

SLO 4.2: present research findings in a scholarly manner through oral or poster presentation and be able to respond to questions integrating scholarly knowledge into the response.

SLO 4.2 was evaluated using aspect 6 of the rubric “*Quality of oral communication*” and aspect 9 “*Overall quality of proposal defense*” which focuses on the oral presentation and defense of the document. For aspect 6 the ten students had a mean score of **3.5 of 5 (s.d. 1.27)**, with 8 students scoring proficient or above and 2 students scoring below the proficient level. For aspect 9, “*Overall quality of oral defense*”, the ten students had a mean score of **3.0 of 5 (s.d. 0.94)**, with 8 students scoring proficient or above and 2 students scoring below the proficient level.

4. What changes, if any, do you recommend based on the assessment data?

Given that mean student rubric scores exceeded or met the level of proficiency in all SLOs, and 70-90% of students scoring proficient or higher in each as well, there seems to be little reason to change current practices. It is notable that the iterative nature of the thesis proposal defense allows students to be reevaluated if they do not receive satisfactory scores in their first attempt. We did not sort rubrics by whether the student passed or failed, so low scores in this evaluation are not necessarily reflective of the student’s final level of proficiency. Additionally, students who are unsatisfactory in their written proposal are typically asked to make substantial edits to the document as part of a “conditional pass”. These final edits are not reflected in the rubric and may reduce writing score means as well as rates of student proficiency.

That said, there is room for improvement in SLO 4.1, expression of procedures, results and conclusions in written format. When evaluated on “*Overall quality of written proposal*” three of the ten students evaluated failed to gain proficiency. This is the lowest level of proficiency amongst the factors measured and could be improved upon. As was mentioned previously, low scores on the rubric may not reflect the final product of the written proposal. However, low written scores at the defense are often due to students submitting proposals that either haven’t been reviewed by any members of the committee or have only undergone minimal revisions. This issue may be remediated encouraging students submit proposal drafts to the thesis advisor for edits and consultation prior to the defense process. Students may be encouraged to submit early drafts of their proposal during annual orientation events. Additionally, thesis advisors may be reminded to reach out to students prior to the defense. One impediment to obtaining a better quality written proposal prior to the proposal defense, however, is that agricultural research and data collection must be coordinated with the growing season of the crop. Hence it has been the practice to proceed with the proposal defense even when more edits are needed on the proposal so that substantial data collection does not occur before obtaining thesis committee input on the design and methodology of the research.

5. If you recommended any changes in your response to Question 4 in last year's assessment report, what progress have you made in implementing these changes? If you did not recommend making any changes in last year's report please write N/A as your answer to this question.

In the last program assessment, it was determined that our master's students were not proficient at generating and expressing hypothesis statements. In part, this is due to a mismatch between the SLO and the realities of much of our plant science research. Due to the applied nature of plant science research many experimental designs do not fit inside the traditional hypothesis driven framework; rather, they focus on the development of new technology/techniques, or they characterize crop production and quality under a specific set of conditions. As such, requiring hypothesis statements does not clearly align with the development of many plant scientists. Nevertheless, additional instruction on hypothesis design was added to AGRI 220 (Biometrics), e.g. the inclusion of hypotheses in the proposal outlines that the students generate in that course, to remediate this lack of hypothesis development.

6. What assessment activities will you be conducting during the next academic year?

Next year we will be conducting an exit survey of Plant Science MS graduates to assess SLO's 1.2 (integrate theoretical concepts from basic sciences into crop production and agro-ecosystem management) and 2.2 (conduct statistical analyses, interpret the statistical output, and draw valid conclusions). This meets our requirement to complete at least one indirect measure of program proficiency.

7. Identify and discuss any major issues identified during your last Program Review and in what ways these issues have or have not been addressed.

In the previous program review, four actionable items were identified. Since the time of the review action has been taken on each. See a summary of each below.

Item 1. Require a research proposal class and acceptance of proposal by committee. Before starting a research project a student should write a proposal that is formally presented to, and accepted by, their major professor and those of the committee. This requirement can take form in a 3-unit Thesis Proposal course and could be required before advancement to candidacy or some other formal designation indicating that this process has occurred as fulfillment toward graduating.

Progress – All enrolled master's students have since been required to develop a draft of their thesis proposal as part of AGRI 220 (Research Methods and Communication). This course is taken within the student's first two semesters of enrollment and emphasizes scientific writing and literacy. Also, incoming students are presented with a graduation timeline at their program orientation, and in their graduate handbook. This timeline provides a clear expectation of timeliness to both students and their faculty advisors.

Item 2. Require graduate coursework outside of departmental classes. Many areas in agriculture require specialized knowledge in field outside those traditionally taught in

agriculture, especially applied agriculture programs. The panel suggests requiring a student to take at least one 3-unit course outside their college.

Progress – No Progress - The Plant Science department does not feel it is in the best interest of students to mandate coursework outside of the department. There is little need for further instruction in basic science, as admission prerequisites require all incoming students be well prepared for the specialized degree. There is also concern that mandatory external coursework would disrupt the program's graduate cohorts, which have proven effective at elevating program quality and retention. Furthermore, the department already allows students to take elective credits outside of the department, and has a substantial list of approved external electives. For example, IT 286 (Applied Spatial Technology), a course related to precision agriculture is often taken by Plant Science graduate students. This practice will be continued.

Item 3. Develop and adhere to, a clearly articulated roadmap for acceptance to graduation. The roadmap would provide guidelines for faculty and students alike and bring conformity and standardization within the department. The guidelines (e.g., in the form of a handbook) would establish, at a minimum, application and admittance processes, assign faculty sponsor/advisor, identify projects, require proposal acceptance, establish coursework and establish formal process for the thesis defense.

Progress – Admission standards and timelines are clearly articulated on the departmental website as well as CSU Apply, thus no adjustments are required. After acceptance, graduation timelines are provided to program students at orientation meetings that are held at the beginning of each semester. This timeline (see Item 1) is also provided in the graduate handbook. It should also be noted that due to the availability of electronic information, particularly on the Graduate Studies website, students are not as inclined to consult our Graduate Program handbook, as in times past.

(<http://www.fresnostate.edu/academics/gradstudies/index.html>)

Item 4. Establish and codify farm and greenhouse resource priorities. The highest level of prioritization for farm and greenhouse utilization and support should be focused on fulfilling the University mission, specifically for instruction and research. Other uses, such as those to generate revenue for the foundation or by leasing to off-campus outside groups should only occur after the internal instructional and research needs have been demonstrably met, even if the financial incentives to support the outside interests are great.

Progress – Currently, we have a high level of involvement of undergraduate students on our university farm as there is a dedicated area for crop production by the Plant Science Club and it provides fresh produce for the Student Cupboard and Food Security Project. Graduate student research on the farm varies according to the specifics of the research. In the last three years, six of the nine graduate faculty members (Drs. Goorahoo, Cassel, Shrestha, Riar, Bushoven and Brar) have conducted research involving graduate students on the university farm. Our greenhouse facility (Horticulture Unit) is also utilized by graduate students, either to carry out experiments or to propagate plants needed for their

experiments. This facility also includes a tissue culture lab that has been integral to some thesis research projects. There are some limitations, however, for graduate student research in the greenhouse, due to the age of the facility and lack of sophisticated environmental monitoring and control (e.g. temperature and light). Leasing to outside groups has not been practiced on the farm to any great extent in recent years, but equipment from Ag technology companies, e.g. soil moisture sensing devices, has been tested on the farm and provides mutual benefits.

In addition, the Jordan Agricultural Research Center (JARC) has been fully equipped and is now widely utilized by most faculty in the department. In the past year, the facility has been the central site of at least ten graduate projects, with many additional students using the space tangentially. This is a particularly valuable facility for graduate faculty and students carrying out research conducted entirely in the lab or growth chamber. Drs. Ellis, Wenger and Brar have very extensive utilization of the JARC laboratories.

EVALUATION RUBRIC: Masters of Plant Science: Thesis Proposal Defense Date: _____

Student Name: _____ Committee Chair/Evaluator Name: _____

Thesis Proposal Title: _____

Check one for each criterion & provide comments. Answer collectively based on thesis proposal and/or proposal defense.					
	Unsatisfactory	Marginal	Satisfactory	Very Good	Outstanding
Criteria for Evaluation	(1)	(2)	(3)	(4)	(5)
1. Problem Definition: <i>Clearly stated the research question and provided a coherent and compelling justification of the research</i>					
2. Literature and Previous Work: <i>Demonstrated sound knowledge of literature in the area, and of prior work on the specific research question</i>					
3. Impact of Proposed Research: <i>Demonstrated the potential value of research to advancing knowledge within the area of study</i>					
4. Approach: <i>Has applied appropriate research design/methods to approach the defined problem and has described the design/methods effectively</i>					
5. Quality of Written Communication: <i>Communicates research proposal clearly and professionally in written form</i>					

Criteria for Evaluation	Unsatisfactory	Marginal	Satisfactory	Very Good	Outstanding
	(1)	(2)	(3)	(4)	(5)
6. Quality of Oral Communication: Communicates research proposal clearly and professionally in oral form					
7. Critical Thinking: Has demonstrated capability for articulating and interrogating key problems and approaches in the field					
8. Broader Impact: Demonstrates awareness of broader implications of the proposed research. Broader implications may include social, economic, technical, ethical, business, etc. aspects.					

Overall Assessment: overall performance of thesis proposal and its defense based on the evidence provided in items 1 – 8 above

OVERALL Rating of the:	Does NOT PASS	PASSES			
	Unsatisfactory	Marginal	Satisfactory	Very Good	Outstanding
Written thesis proposal					
Thesis proposal defense					

Overall Comments:

