

First Draft New Faculty Plan: [REDACTED] [REDACTED]

A. Faculty Self-Assessment

I was most excited about coming to BYU because of the wonderful experience I had at BYU-Idaho as an undergraduate student. The opportunity to receive a world class education in a science field (for me) blended with scripture and spiritual growth made all the difference in the way I approached problems and how I chose to view the world. I hope that the skills and strengths I bring to BYU and to the Plant and Wildlife Science Department impact the ability of students to have similar experiences.

I have always enjoyed building analogies between gospel topics and life science subjects. The ability to blend gospel principles with science I think is a strength. I am friendly and enjoy getting to know people, this means that I was able to build a substantial network of friends and colleagues pre-BYU. This network will help me to provide real-world opportunities for students to work, intern and learn from professionals across my field. This is a strength. I am organized and enjoy building structure. In my capacity directing the life science greenhouse the organizational strength, and hands-on skills will be a blessing to the facility and the department as we transform areas of the greenhouse into learning spaces for faculty and students.

I have covered some skills in the prior paragraph and so instead will talk about formal skills and experience here. I have experience working and publishing papers in field agriculture. I have skills in building, caring for, collecting data on and teaching about pollinators (honey bees, bumble bees and various megachilid bees). I have experience working with producers and consumers on tree fruit and small fruit projects and understand the business side of agriculture as well as the complexities of field management, research integration and post-harvest processing. I directed the new crops program for a vertical farm company and have skills related to managing teams, building team members and helping them to grow. I know how to speak with inter-disciplinary groups and spent much of my time in past positions working closely with engineering, chemistry, farm operations and computer programming groups.

I am passionate about sustainable plant systems, whether in traditional field agriculture or indoor controlled environment spaces. I care deeply about solving large problems without reducing the agency. I am interested in conducting research in controlled environment horticulture, particularly in solving emerging issues related to system design (ie. Transpirational efficiencies indoors with HVAC). I am interested in mentoring students to prepare them to work in these new indoor, high tech agriculture fields by teaching them to balance a passion for sustainability (environmental care and renewable resource application) with innovation and the power generated by free market systems to change society in the long run. I am very interested in the potential for interdisciplinary connections inside and outside of BYU, and have begun to forge relationships with professors in the engineering, computer science and food technology areas of campus to further my goals and expose students to broader thoughts, teaching them to speak the languages of other disciplines as well as they speak their own.

B. Faculty Professional Goals

Here I will break down goals into three categories, which are the three main parts to my professional faculty contract: Direction of the Life Science Greenhouse, Mentoring and Teaching.

Life Science Greenhouse Direction (PROFESSIONAL)

When I started in July of 2020 I performed a “state of the facility” exercise to record what I saw. In the last year many of my goals for the greenhouse have been realized or are in the process of being realized. Those are included in section E.

Physical goals for the Life Science Greenhouse include:

- The transformation from antiquated environmental controls systems to a custom in-house control system. This system will give tighter control of set-points, but also localized control of research spaces to faculty using research bays.
- Upgrade of the high pressure sodium supplemental lights in teaching bays to energy efficient and more effective high intensity LED fixtures. This will enhance the appearance and health of plants in our teaching collection as well as improve the student learning and project spaces we have set aside in teaching wing bays.
- Upgrade the storage and organization of the walk-in cooler and freezer in the Head-house. These spaces are currently overflowing and un-navigable with bins of seed. Improved organization, tracking and storage would enable more faculty to take advantage of the space for research and teaching.
- Enhance the teaching space in the head-house. We have already begun to work with IT to install official teaching space (75” TV with computer for lectures, microphones and speakers for blended and distance learning). We also wish to upgrade the tables and chairs in that space to accommodate ~20 students.
- We have already added back-up heating equipment to each wing to prevent heater failure in the winter that kills research projects. Enhanced back up controls will be added as part of the controls overhaul, including electric bay heaters that back up gas furnaces, etc. Back-up lighting is not feasible in a greenhouse this size but enhanced alarm systems, localized controls and the ability to make small changes from bay to bay will aid in this issue moving forward.
- Active humidity controls to the “Tree” room will be added, these will be similar to what we already installed in the “Tropical” room. Allowing for a more natural irrigation similar to rain that cleans and adds moisture to the air. This will improve our ability to add tropical plants to the collection and see them flourish.

Mentoring Students

- It is my goal to maintain at least 5-10 mentored learning students in the hydroponic learning lab each year (with at least 5 new students each year). Providing these students the ability to learn hydroponic principles like sustainable indoor production, water quality assessment and management, nutrient management, etc.

- It is my goal to use the greenhouse student employee pool to provide students learning opportunities in greenhouse and controlled environment management, rather than just busy work and grunt tasks.
- It is my goal to aid at least one student each year in finding an internship in controlled environment agriculture and to place as many students as have interest in jobs related to plant systems. In section E I will expound on the work done in the last year on this topic.
- I hope to create a structure over time where students develop through mentored learning and employment and take on student manager positions. Allowing them to hire their replacements, understand and gain experience in management as well as the skills of the field.
- I intend to fund student research with both out-side grants as well as university funding opportunities. The goal is to fund 2 student projects each year.
- I intend to help 1-2 undergraduate students each year to publish some part of their work. Whether this is a poster in a university symposium, peer reviewed publications they participate on or trade journal articles, I think the ability to organize work so that it can be shared is critical to a rounded undergrad experience.

Teaching

- My broad goal in teaching is to enlarge the course offerings for upper level courses in sustainable production, food security and controlled environment systems.
- It is my goal to maintain student ratings above 4.5 and hold the rigor of courses I teach so that the GPA is 3.2-3.4 on average.
- It is my goal to teach 9 credits a year, currently that means a three credit class in the Fall, Winter and Spring.
- My goal is to use mid-course evaluations, faculty mentors and class observations to improve my courses both in clarity and student learning as well as rigor and content.
- In the spirit of experiential learning it is my goal to not lecture for longer than 10 minutes with a break for discussion and to provide daily (when possible) experiential learning opportunities for students to practice what we are learning and develop critical thinking (critical application) skills.
- It is my goal to hold as many classes I teach as is physically possible (class size for some course makes it impossible) in the Life Science Greenhouse. The proximity of the classroom instruction to the structures, tools and life examples enhances the student's ability to remember and understand topics.

C. Relationship between Individual Goals and Department/University Aspirations and Needs

I'm unsure how to answer and fill out this section then any of the others. Mainly because I feel like everything we are doing is in line with the goals of the University.

I have a strong desire and believe in the experiential learning mission. The setting aside of space and resources to give students real world, hands on experience in the field they are studying before graduation is vital. Students with these experiences will be prepared to hit the ground running and be productive, high energy contributors rather than passive, timid learners (not to say that continued learning isn't critical to success).

My goals align with those I have heard and had communicated to me from the department as well. Specifically, the transitioning of the greenhouse from a periphery structure to a thoroughfare of student opportunity. Creating and maintaining inviting student learning spaces, presenting new resources to faculty to better utilize the space and understand the changes in available resources is also important.

D. Resources Needed

Dr. [REDACTED] the Department Chair for the Plant and Wildlife Science Department have discussed resources needed for many if not all of these goals. We need financial assistance for the improvement projects in the greenhouse and for the maintenance of them afterwards. We need financial assistance to fund student employees who work to maintain the greenhouse and plant collections. We need financial assistance in the start at least to help with mentored learning projects.

Dr. [REDACTED] has been generous with funds and I have had all that I needed in this first year (evidenced by the number of projects we were able to accomplish).

Another resource I need to be successful is understanding of the bureaucracy of BYU. It is a large institution with a lot of resources and opportunities (more than anywhere else I have been), but it can be very difficult to learn about or understand how to access resources (or even know where to start looking).

I'd like to discuss what it might look like in the future to shift teaching from the spring term (where enrollment was very low) to either a different grad level course or a second section in the fall or winter. Mainly to free up time in the spring term to focus on season changes in the greenhouse space and with organizing student work and major practicum activities.

E. To-Date Activities and Accomplishments

Here I will also break down activities and accomplishments into three categories, which are the three main parts to my professional faculty contract: Direction of the Life Science Greenhouse, Mentoring and Teaching.

Physical goals for the Life Science Greenhouse include (PROFESSIONAL):

- Cleaning. I add this because it has been a significant time sync in the first year to dispose of a decade of outdated and un-needed equipment and material. We emptied and unlocked storage cupboards, organized and breathed new life into the head-house and outdoor storage spaces.

- Instituted cover cropping in the field plots behind the greenhouse to increase organic matter. Also added 60 yards of compost to the field plots and tilled it in for the same purpose. This will help to improve the soil quality and kinds of projects which can be executed on in the future.
- Organized the construction of a Quonset structure in the field plots for faculty and student use to overwinter plants without needing to stress greenhouse systems with low temperatures.
- Organized an instructional hive with one way glass to be installed in the BYU greenhouse to enhance - learning opportunities and expose students to additional, key parts of sustainable production including pollination.
- Built from scratch a hydroponic learning lab. The student learning space houses multiple plant systems and provides the opportunity for students to grow plants in controlled environment systems and to understand the many facets of CEA and the science behind robust plant growth.
- Student accessibility. I have tried to improve the accessibility of the greenhouse space, making it a more welcoming space for faculty to hold classes and labs and for students to visit, work, study and conduct mentored learning and experiential projects. Specifically we have unlocked all the drawers, clearly labeling them and providing shared materials for projects. We have removed clutter and added posters, graphics that turn the space into a classroom rather than a shop.
- Teaching Plant Collection Overhaul. I separated the teaching collection, which previously was in a single room into three separate spaces. This allowed for the separation and targeted care of plants with different environmental needs (desert, temperate and tropical). I sold as surplus some 1,800 plants, providing an opportunity for students to learn experientially by marketing and organizing the sale, preparing and pricing the plants and selling the plants themselves (generated ~\$12,000 from plants that would otherwise have been disposed of).
- Enhanced Grow Spaces. I added automated irrigation to all teaching bays. Previously students spent hundreds of hours a year hand watering plants. Now students can spend their time on tasks geared more towards developing skills in the field and enhancing their understanding of plant production and environmental control. This project took a few months and included teaching students to design and install specialized irrigation hardware (including one unit on the ceiling that simulates rainforest rain).
- I met with Utah Department of Agriculture personnel and made the changes to the greenhouse pesticide storage and management systems to ensure we are in compliance with state regulations and that we are fostering an environment safe for students and faculty. This included re-organizing the pesticide space, disposing of hundreds of chemicals that were expired, miss-labeled or in illegal containers. Then labeling, installing proper signage and updating all the chemical storage records.
- Installation of non-slip mats in high traffic wet cement areas for student/faculty safety.
- Integrated Pest Management. The way we apply pesticides to the greenhouse and field plots is important, as it allows research to continue un-impeded by pests and the damage they do to crops. But pest management also must take into account the continual student presence in some spaces and the need for flexibility. I set up a threshold system in the greenhouse, allowing research bays to elect the threshold they must maintain (in many cases a low threshold that requires spraying insecticides regularly), in the teaching wing we set thresholds very high (damage is generally cosmetic and since

these plants are used for student research and instruction low residue levels are more important than perfect looking plants). We have not applied insecticides to the research wing in the 14 months I have been at BYU, instead we have developed a regime of beneficial insect releases to combat common greenhouse pests and maintain plant health.

- We created an experiential learning lab in the large room that was previously a collection space. This room as permanent storage for classes that regularly hold class in the greenhouse and large open benches for labs to meet and to store student group projects, etc.

Mentoring Students

- In year 1 I have mentored (am mentoring) 20 students from 4 different majors. This includes weekly meetings with these students, project design and hands on project development.

- I had two students awarded CURA grants and currently working on posters to present at this year's CURA symposium and next year at the American Society for Horticulture Science's annual meeting.

- I placed 6 students in off campus jobs that paid \$18+/hour and work with their school schedules. These jobs were created through consulting jobs I did with industry partners. Specifically in plant and landscape systems work.

- One of these students was offered and accepted a full time position as a result of this job for Arboreal Studios (a local company that has done artistic work for Walt Disney World and other world class venues).

- I have 1 students who applied for a study abroad program with USAID and was accepted, but due to COVID restrictions was unable to travel.

- I have 1 student who completed a joint Invention Disclosure for a project we have been working on and will work with the university on a patent application in the coming year.

Teaching

- I attended the Center for Teaching and Learning's new faculty teaching series and created a course to pilot in the fall based on the instruction and structure presented.

- I have used the CTI resources to have mid-course evaluations each term I have taught and made adjustments to improve my course based on the feedback from students.

- I taught PWS 100 a general education science course in the Winter 21' and Spring 21' and had student ratings at or above 4.5 and GPAs between 3.2 and 3.6.

- I designed and am working to submit through the department curriculum committee a new course "Sustainable Plant Systems" with heavy focus on food security and controlled environment agriculture. I have 12 students enrolled in the pilot (393R) version for the Fall 21'

F. Comments- Citizenship Proposal

The field of controlled environment agriculture (horticulture) is relatively new and as such many universities have new programs and transitioning faculty moving to cover topical ground and prepare students. In my experience with private companies in the field the weakness of students entering the field is their inability to communicate effectively with individuals in other fields. Therefore my citizenship goals are closely related to my professional development goals, with the extension of interdisciplinary involvement in projects.

Accomplishments in Year 1

-I have communicated with, met in person with and begun grant proposals and smaller undergraduate projects with a professor in the engineering department and the food technology major.

-I met with representatives of the Ballard Center and began to discuss the inclusion of my courses and mentoring opportunities into a non-profit major that will enhance the interdisciplinary aspects of food security and controlled environment horticulture.

-I brought colleagues from past jobs onto campus (digitally) to give seminars/guest lectures to students. These individuals were Dr. [REDACTED] CSO of [REDACTED] and Mr. [REDACTED] Co-Founder [REDACTED]

Dec. 2021 Goals

- 1) Implement cross-disciplinary pollinator project at the life science greenhouse (with Dr. [REDACTED])
- 2) Visit the USU greenhouse with Dr. [REDACTED] to forge connections with their computer science and controls team as a first step in customizing our own controls systems.

Long Term Goals

-It is my intention to have at least one guest lecture in my systems course each year from another university or company who is not a life science major.

-It is my intention to work to develop an interdisciplinary program where PWS students can gain experience and understanding in engineering and engineering students have the opportunity to gain basic plant science background (working with Dr. [REDACTED])

-It is my intention to broaden the use of the Life Science Greenhouse to other departments in the College including Biology and Exercise Science as we strive to increase both student interest in biological science but also post-graduation opportunities based on a broader set of key experiences.