

General Statements and Response of the CAFNRM Dean

CAFNRM was established through a 1974 Legislative mandate (ACT 191 [H.B. No. 1387]) to be a high-quality, hands-on, undergraduate agriculture program. It is ideally situated to tackle relevant and important topics in tropical horticultural and agronomic plant science, livestock production and animal health, aquaculture, agribusiness and bioeconomy, equine studies, and some areas of forestry.

- For the past 10+ years, the College has consistently received 50 to 70% less than its pre-Great Recession (2005 – 2007) funding level for non-salary operational support. Hence, there was little buffer when the COVID-19 era began.
- Enrollment during the five-year review period dropped by 30% prior to leveling off with a slight gain in Fall 2020. The UH System projects that enrollment in CAFNRM will remain flat through 2026.
- While overall quality in some hands-on components of the program have declined during the past decade, a resurgence is underway, particularly in the pre-vet/animal science area, with the hiring of the two newest faculty and commitment by the UH Hilo Farm staff. Having a farm just five minutes away from the main campus is the crown jewel of the College.
- Since 2017, enrollment has been increasing in the pre-vet/animal science area while it has declined by 30% in the plant area. These trends appear to be linked in part to the level of hands-on activities at the farm and changing student expectations. Hence, a current priority exists for enhanced plant activities as the animal side has developed a fairly stable foundation coupled with expanded offerings in the equine area. The aquaculture specialty has suffered from persistent low enrollment and the faculty have not made changes to the curriculum core in over a decade other than a new aquatic nutrition course that will be offered for the first time in Fall 21.
- Faculty consistently provide high-quality instruction along with student mentoring and university service, constraining their ability to optimally participate in other critical activities (e.g., locally applied field research and community service/outreach).
- Interdisciplinary approaches, innovative teaching and resources, and professional development need to be put in place for CAFNRM personnel and students to thrive and to ensure faculty, students, and the general public are informed on modern agriculture. This approach is required in order for Hawai'i agriculture to keep up with evolving technologies providing greater efficiency, sustainability, and resilience. With a few exceptions, agricultural technology in Hawai'i has increasingly had difficulty keeping up with developments elsewhere.
- Improvements to all CAFNRM programs will assist in keeping abreast of disciplinary change, growth, and workforce development in the ag sector.
- Quality in some areas has been driven by the dedication of a few key faculty actively engaged in grant and donation activities. Most personnel feel overwhelmed because of their many responsibilities and (or) the declines in general funded resources and support.
- Faculty constantly feel challenged in meeting grant and donor deliverables in a timely manner, let alone getting articles published in reputable journals.
- Much of the agricultural equipment, facilities, and levels of automation are antiquated relative to current nationwide trends. Upgrades in these areas, including equipment simulators, would allow CAFNRM to graduate students better prepared to enter the workforce and able to compete for technologically-driven agricultural jobs, including emerging economies abroad.

- The teaching load of 3-courses with labs per semester coupled with service/outreach is challenging when performed in conjunction with extramurally funded projects, resulting in some personnel approaching “burnout” level.
- Several entrepreneurial faculty have pursued extramural funding to develop synergistic efforts for undergraduate learning and improvement of CAFNRM outcomes.
- Addressing technology gaps in precision agriculture, crop improvement, and automation by revamping courses and development of new courses will assist with improved learning outcomes.
- Hawaii’s government and private sector often state the need to diversify our economy from tourism however there needs to be policy changes to incentivize agricultural and bio-economy revitalization and entrepreneurship. And agri-tourism could certainly be part of that diversification mix.
- CAFNRM needs financial support to modernize its equipment and labs in order for its graduates to be uniquely positioned to meet the needs of the local workforce now and in the future. For too long the approach has been based on a low-tech, subsistence/hobby farming and gardening mindset.

Critical and Immediate Issues

The UH Hilo Farm and Pacific Aquaculture & Coastal Resources Center (PACRC) are in need of renovations and adequate base operational budgets. These multifaceted teaching, research, and outreach facilities cannot be operated solely relying on revolving funds generated from product sales as the primary source of funds. The aquaponics facility at the UH Hilo Farm recently had to be shut down in part because of an inadequate revenue stream to comply with the animal care regulatory requirements for densely stocked fish systems. CAFNRM must also work to encourage and mentor junior faculty in order to retain them during this critical time when more retirements are expected and hiring of replacements is expected to be slow. The faculty need to be supported if CAFNRM is to contribute to:

- 1) Improving food self-sufficiency and sustainability/resilience under a changing climate
- 2) Strengthening the agricultural economy and bio-economy in Hawai’i and
- 3) Training Hawai’i’s workforce with qualified faculty familiar with local and tropical conditions and cultures.

Similarly, while recently revamped, the colleges’ instructional programs still need interdisciplinary revisions to be better balanced among:

- 1) The molecular, cellular, genetic improvement, and organismal physiological scales,
- 2) The agroecological, economic, agritourism, community, and biocultural scales, and
- 3) The modeling, bioinformatic, sensor, robotics/drones, smart farming/controlled cultivation, predictive agriculture scales

These changes are needed to develop economically and environmentally sustainable farming systems and optimally train students for the future. Given Hawai’i’s high operational costs, sensitive environment, and unique political environment, input optimization and use of modern agricultural equipment is key. The College desperately needs to reestablish the specialty in agribusiness and bioeconomy in partnership with the College of Business and Economics (COBE) and perhaps other institutions. This program ended in 2012 with the loss of an agribusiness professor whose position was

never replaced. Private sector employers and statewide agricultural workforce surveys conducted by the Department of Labor and Industrial Relations (DLIR) and the Hawai'i Department of Agriculture (HDOA) indicate that the lack of agricultural business skills is a major limitation in terms of employees and growth of the agricultural sector.

CAFNRM also has secured donor funding to initiate the development of a cross-college program in wildlife and fisheries and has been currently offering several wildlife courses, including one at the graduate level through the Tropical Conservation Biology & Environmental Studies (TCBES) program in the College of Natural and Health Sciences (CNHS). Some aspects of the PACRC facility and the aquaculture curriculum could be integrated into wildlife and fisheries.

Another area of increasing student interest is the potential to develop a specialty in equine studies which embeds components of agribusiness and agri-tourism. The UH Hilo Farm has an indoor arena and much of the infrastructure in place which presently serves the needs of the equine science certificate.

A major threat to CAFNRM enrollment is fully online undergraduate agriculture programs with increasing numbers of neighbor island students availing of offerings from institutions like Oregon State University rather than coming to Hilo. The idea of establishing a limited residency program for developing hands on skill sets while offering the rest of the degree online has been suggested by some.

Like many UH Hilo programs, there is room for much improvement in the assessment area for both the core competencies required by the accrediting body, WSCUC, and also the stated program learning goals and hands-on skill sets. We need to identify ways to practically show learning throughout a student's time in CAFNRM and that our students can demonstrate increasing proficiency in:

- 1) Modern hands-on agro-ecological field production skill sets, including proficiency in propagation and transplanting, crop planning, soil-plant-water-tissue sampling and preparation for analysis, measuring biodiversity, identifying plants, diseases and insects, controlling diseases and pests, agricultural mechanization and modern field sensor equipment;
- 2) Modern livestock production skill sets such as safe handling, feeding, breeding and reproduction, disease management, etc.
- 3) The basic quantitative techniques necessary in agricultural analytical laboratories and interpreting the analyses;
- 4) Simple prediction/modeling functions that are commonly used in agricultural science and business;
- 5) Communicate effectively in writing and orally in the submission of business/research/policy plans proposals, and reports;
- 6) Record keeping and agricultural input management in an environmentally friendly and economically viable manner.
- 7) Community engagement, social, and outreach skills in diverse communities.

Support and Organization of Teaching

The overall feeling of CAFNRM students and faculty is that University support for quality hands-on instruction has been declining. This sentiment has become more pronounced with on-line learning deemed necessary to mitigate the spread of COVID-19. Over the past 5 years, the college has done a remarkable job of holding the teaching program together even though half of its agricultural faculty (5)

retired and 1 resigned. Out of these five vacancies, only three positions were filled. Further, three of the retiring faculty took extended sick leaves of a semester or more prior to retiring while another senior faculty member was on half-time leave or more for several semesters prior to retiring in July 202. Most of the teaching limitations have been addressed by other faculty attempting to cover for faculty on leave or vacant positions. This action sometimes resulted in faculty teaching outside of their areas of expertise which occasionally led to disappointed students.

The following are questions meant to help deans evaluate self-studies:

- *How well does the program support student learning? Do assessment activities support quality learning? If not, what strategies or initiatives can or should be undertaken?*

Student learning goals are, in principle, achieved through a combination of theoretical lectures and hands-on activities in the field and wet laboratories. The relative proficiencies achieved vary depending on student knowledge of the natural sciences and their mechanical skill set comfort levels. Students who are interested in attending graduate school are advised to use their elective hours to take more chemistry, biology, and math than is required for the more or less terminal B.S. in Agriculture degree. There is still much room to modify the curricula to make our students more competitive in the respective specialties. This being said, there are often faculty debates about how too many modifications in the name of rigor may negatively impact enrollment. A bigger concern is the less than desired level of modern technology, industry-relevant skill sets; and data management.

The College has performed a few upper division core competency assessments but it is questionable if these assessments clearly demonstrate student success or it is merely to check off a box with the UH Hilo Assessment Support Committee and the accrediting body. Although assessment has the potential to be useful to improve instruction, a wider culture of assessment has yet to be embraced by most of the faculty. The primary reason is they seriously question the utility of any efforts to implement effective change in the absence of adequate resources for instructional improvement. This being said, content improvements can be made in the lecture portions of courses without having physical access to the laboratory and field resources.

- *How good are they at tracking student success, especially in terms of system performance goals?*

During the past five years the college has consistently averaged at least 30% or more Native Hawaiian students and presently has 41%. During the past five years 25% of the college's graduates have been Native Hawaiian.

- *Does the data support on-time completion? Does the data exist to show their 4-year course map works?*

In Spring 2019, 40% of the college's students graduated in four years while 80% finished in five years. For comparison, purposes an average of only 49% of the college's students graduated in six years between 2008 to 2014. Graduating in four years is quite challenging in a program requiring extensive laboratory courses when most students are also working and (or) have time consuming family responsibilities. The difficulties of trying to balance work/family responsibilities with school is a primary reason why a 4-year completion does not occur more than half of our students. This being said, the fact

that 40% do graduate in 4-years demonstrates that the 4-year course map and associated substitutions/curriculum modifications can work.

- *How effective is the program's efforts to mentor and usher students through the major?*

The College's curriculum committee, faculty advisors, and dean work closely with students to get them through the program in a timely manner. Again, many students are quite clear up front that a 4-year plan is not as realistic for them as a 5-year plan due to other responsibilities in their lives.

- *Effective scheduling: how well does the unit do in terms of maximizing SSH for the major? How effective is the scheduling of lower division versus upper division courses?*

Due to embedded hands-on laboratories, the required level of student oversight to ensure student safety in living laboratories such as those held at the UH Hilo Farm and PACRC, and limited facility capacity, high enrollment is not possible for most of the College's courses. As most of the College's courses are upper division, there are not apparent challenges in scheduling lower versus upper division courses. Many students are also attracted to the small class size and appreciate frequent face-to-face interaction with faculty.

- *Faculty service and productivity—are they doing a good job in maintaining their research and does this research have any impact/bearing on instruction? Are their publications and conferences of sound quality? (This is in light of overall faculty performance in tenure and promotion guidelines, including five-year post-tenure review)*

Most faculty are active in research and embed aspects of their research in their instruction either through direct student participation or sharing the research activities and the potential local benefits. The challenge for most faculty is finding the time to publish their findings. Others are too busy chasing and managing grants and donations than publishing.

- *Cost per SSH, is this realistic? Are there ways to be more fiscally efficient?*

Agriculture is an inherently expensive major with light and heavy equipment purchases, repairs and maintenance, and laboratory and field facilities with plants and livestock (requiring compliance with strict institutional animal care protocols) which must be maintained throughout the year. Additionally, placing student safety first when using equipment and other specialized tools imposes capacity constraints on the number of students that can be handled in many of the classes. The College could reduce costs by reducing laboratory activities and scaling back at support facilities but this would jeopardize the hands-on learning mission. The PACRC facility is highly expensive relative to the number of students served in course instruction. Maintaining the food animal livestock herds at the UH Hilo Farm is also expensive with rising veterinary and feed costs. The inherent high cost of agricultural production is also reflected in the higher cost to prepare students for the local, national, and international workforce.

It also should be noted that CAFNRM costs per SSH are also inflated by the fact that several of the faculty teach courses for other programs (TCBES and CNHS departments) and these costs are not deducted from those of CAFNRM.

- *How fiscally efficient are they in terms of the use of full-time hires versus lecturers?*

The College has done the best it can by reassigning permanent or tenure-track faculty time to teaching required courses rather than hiring lecturers. Lecturers were still sometimes needed when faculty went out on sick leave. Otherwise, the only lecturers in CAFNRM were those paid for through donations. As previously mentioned sometimes having faculty teach outside of their areas of expertise led to unsatisfied students.

Concluding Statements

CAFNRM is making a meaningful impact on UH Hilo students and is positioned to be a leader in undergraduate production agriculture training for the tropics. It is situated in one of the most diverse and ideal areas for tropical agricultural research on earth with so many climates, soil types, and ability to raise a wide variety of crops and livestock. CAFNRM also has a dedicated faculty committed to the mission of educating students for our local workforce. This being said, it will require commitment from the State government, the UH Hilo administration, and the University of Hawai'i system for CAFNRM to realize its full potential in providing leading-edge instruction, applied research, and technology transfer services to advance Hawai'i's agriculture and biological economy.

Agriculture and food systems are inherently interdisciplinary and face multidimensional issues, however there are opportunities to improve on preparing students to solve whole system and multi-perspective challenges rather than those of isolated disciplines. The Ag 230 Sustainable Agriculture course is a gateway exposure course which introduces students to the complexity of agricultural production systems and encourages inquisitiveness. We can do more to pull it all together in a senior level course after they have completed their disciplinary requirements. Perhaps such a capstone course should be called Sustainable Food and Energy Systems.

While it is generally accepted that most students entering CAFNRM are primarily interested in acquisition of agricultural production skills this does not align with their career expectations. A 2018 UH Hilo Student Association Survey found that only 28% of CAFNRM students desire a career with some aspect of farming while 62% want a career in government or the agricultural service sector, and 10% don't know. These sort of trends have been observed at other universities (Hilimire et al., 2014, *Agroecology and Sustainable Food Systems* 38:722-743) and demonstrates a need to connect students to range of agricultural system skills beyond hands-on production and associated farm work. These findings will need to be considered when identifying CAFNRM priorities.

Finally, despite increasing political advocacy in Hawai'i for improved food security and greater local food production there is a widely held belief locally that agriculture is often not promoted in K-12 education as a vocation for brighter students. Both the production and support sectors of agriculture critically need more skilled and educated employees. Drivers for sustainable agriculture education must take into account increased reliance on technology, environmental concerns, and regulatory requirements.