

April 9, 2014

MEMORANDUM

TO: Chuck Gee
Chair, Academic Affairs Committee
Board of Regents

VIA: David Lassner
Interim President

VIA: John Morton
Vice President for Community Colleges

FROM: Helen Cox
Chancellor
Kauai Community College

Manuel Cabral
Chancellor
Leeward Community College

SUBJECT: BOR ACADEMIC AFFAIRS COMMITTEE ACTION MEMO

SPECIFIC ACTION REQUESTED

Request approval of a new provisional degree, Associate in Science (AS) in Plant Biology and Tropical Agriculture (PBT) at Kauai and Leeward Community Colleges

RECOMMENDED EFFECTIVE DATE:

Fall 2014

BACKGROUND:

Significance/Contribution of this degree:

The new Associate in Science in Plant Biology and Tropical Agriculture (PBT) and certificate programs at Kauai and Leeward Community Colleges will address a current workforce need in agriculture and support state and federal strategies for increasing food security and self-sufficiency. The program objectives are to prepare students for Hawaii's agribusiness and natural resource management sectors and provide education and experience needed for various agriculture-related occupations. The students, both traditional and non-traditional, will enter the workforce with higher-level skill sets.

The programs offer comprehensive courses in science, agriculture and business management; and include field, laboratory work and workplace experience through internships. The subjects include plants, soils, crop production, pest management, landscaping, business principles, nutrition, agriculture and the environment. The PBT programs provide an opportunity for non-traditional returning adult learners (industry professionals) to return for a degree that is suitable for the

workforce needs. The traditional college students will be prepared to start their career with better job skills and training.

Cost and resource allocation/reallocation implications:

Kauai and Leeward CC's already own the majority of equipment and supplies needed to operate the PBT programs as these were funded by the Trade Adjustment Assistance Community College and Career Training (C3T) Grant Project. Current personnel are also being funded through this project. However, as the AS in PBT programs are fully offered, two FTE faculty at Kauai CC, one FTE faculty and one agriculture technician at Leeward CC, and additional costs for equipment, supplies, and other resources will be required at both colleges.

Additional grant opportunities are currently being investigated as means to support start-up and maintenance costs for the new agriculture programs.

Demand projections:

Discussions with agricultural employers and organizations identified the need for a more skilled labor force with a minimum AS level of technical and scientific training. According to the Occupational Information Network (O*NET), Employment Projections, and data from the Bureau of Labor Statistics, many of the agriculture occupations considered are expected to grow in the next several years as a result of new job openings and replacements. Kauai and Leeward CC's have an average of 1,500 and 8,000 headcount enrollment respectively, representing diverse nationalities and cultures. The PBT programs will recruit students from incoming freshmen who are interested in science and agriculture and/or seeking a Plant Biology and Tropical Agriculture degrees; non-majors who are interested in Science; employees and other non-traditional students in agriculture, and business organizations who intend to gain more skills and experiences in agriculture to expand their career opportunities.

Accreditation impact (if any):

The enrollment in the PBT Programs and in the existing credit courses are expected to increase. Discussions at the program coordinator level have developed a comprehensive strategy to build courses and degrees that will articulate across different campuses. Kauai and Leeward CC faculties have also been working with the other CC's to update courses, curricula and to align with other colleges in the UH system. We anticipate positive impact on accreditation, as the program will increase student's success in academics and the workforce.

Examples (2-3) of similar models from peer institutions:

North Arkansas College – Associate of Science Degree in Agriculture
http://www.northark.edu/academics_programs/agriculture.aspx

Palo Alto College – Associate of Science with a concentration in Agriculture
http://mypaccatalog.alamo.edu/preview_program.php?catoid=88&poid=5879&returnto=3220

Sheridan College – Associate of Science in Agricultural Science
<http://www.sheridan.edu/site/sc/academics/ag-home/>

Peer and Benchmark Comparison Groups, Institutional Research Office, University of Hawaii, August 2012, <http://www.hawaii.edu/cgi-bin/iro/maps?Pbuhf12.pdf>

Similar programs at other UH campuses (if there is duplication, why is this program necessary):

The detail of two examples of similar models from other UH campuses can be viewed at the following websites.

<http://hawaii.hawaii.edu/counseling/advising-sheets/ag.pdf>

Hawaii Community College offers Agriculture programs: Certificates of Competence (CO) 7-9 credits, Certificates of Completion (CC) 12-18 credits, Certificates of Achievement (CA) 30 credits, and Associate in Applied Science (AAS) Degree 62-63 credits.

<http://maui.hawaii.edu/agriculture-natural-resources-aas-ca-cc-co/>

University of Hawaii Maui College offers Agriculture & Natural Resources programs: Certificates of Competence (CO) in Agriculture Science, GIS in Ecosystem, Nursery Production, Pest Management, 7-9 credits; Certificates of Completion (CC) in Turfgrass Specialist, Sustainable Tropical Crop Production, Landscape Maintenance, 13-23 credits; Certificates of Achievement (CA) in Floriculture Management, Horticulture & Landscape Maintenance, Nursery Management, Sustainable Tropical Crop Management 27-41 credits; and Associate in Applied Science (AAS) Degree in Horticulture & Landscape Maintenance, Sustainable Tropical Crop Management 60-62 credits.

As indicated above, Hawaii CC and UH Maui College have courses in agriculture, including an AAS degree. Hawaii CC has lower level of courses that designed for Hawai'i Island community. Maui CC offers number of courses for many certificates, pathways and focuses that differ from Kauai and Leeward CC's existing courses. Kauai CC currently has an Academic Subject Certificate which was modeled after Leeward CC's program. Kauai and Leeward CC's are currently partnering together in developing the new AS in Plant Biology and Tropical Agriculture along with the CA, and CO certificates. The new AS degree will be built upon the existing courses in the PBT Academic Subject Certificate.

Statement from campus administration of new program's strategic value within the UH priorities:

The new Plant Biology and Tropical Agriculture (PBT) Program will be one of the Career and Technical Education Programs offered at Kauai and Leeward CC's. PBT is aligned with Goal B – Globally Competitive Workforce of the College's Strategic Plan, as it "addresses critical workforce shortages and prepares students for effective engagement and leadership in a global environment."

ACTION RECOMMENDED:

Recommend approval of a new provisional degree, Associate in Science (AS) in Plant Biology and Tropical Agriculture (PBT) at Kauai and Leeward Community Colleges

Attachment(s)

Joint New Program Proposal for a new Associate in Science (AS) degree in Plant Biology and Tropical Agriculture (PBT)

c: Joanne Itano, Interim Executive Vice President for Academic Affairs (without attachment)



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New Program Proposal

**Associate in Science (AS) degree in
Plant Biology and Tropical Agriculture**

Date of Proposal: Spring 2014
Proposed Date of Implementation: Fall 2014

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I. Program Objectives

Kaua'i Community College (Kaua'i CC) and Leeward Community College (Leeward CC) are proposing a two-year Associate in Science (AS) degree in Plant Biology and Tropical Agriculture (PBT). The proposed curriculum is the result of extensive consultation with all UHCC campus agriculture programs and with campus advisory committees including representatives from industry and academia. The AS degree program at Kaua'i CC and Leeward CC was developed in order to provide students on Kaua'i and O'ahu with a foundation in agricultural principles and skills to meet the workforce needs of a changing agriculture industry in Hawai'i. The program is also tailored to offer a pathway to baccalaureate programs at the University of Hawai'i at Mānoa College of Tropical Agriculture and Human Resources (CTAHR), and the University of Hawai'i at Hilo College of Agriculture, Forestry, and Natural Resource Management (CAFNRM) or other institutions.

A. Program Student Learning Outcomes

The AS degree program in Plant Biology and Tropical Agriculture is organized around five core program student learning outcomes (PSLO's) that are shared between Leeward CC and Kaua'i CC. Table 1 outlines the core PSLO's and individual campus PSLO's. Kaua'i CC has one additional campus specific PSLO, and minor wording differences between campuses are the result of individual campus assessment review processes.

Table 1.1: PSLO's for AS Plant Biology and Tropical Agriculture

Core PSLO's	Leeward CC PSLO's	Kaua'i CC PSLO's
1. Use appropriate scientific and agricultural terminology to communicate in different settings and with different audiences.	1. Use appropriate scientific and agricultural terminology to communicate in different settings and with different audiences.	1. Use appropriate scientific and agricultural terminology to communicate in different settings and with different audiences.
2. Identify and analyze the biotic and abiotic factors that affect agricultural production and describe how these factors are managed at the local, state, national, and global level.	2. Identify and analyze the biotic and abiotic factors that affect agricultural production and manage these factors at the local, state, national, and global level.	2. Identify and analyze the biotic and abiotic factors that affect agricultural production and describe how these factors are managed at the local, state, national, and global level.
3. Apply principles and practices from tropical agriculture and plant and soil sciences to improve production and profitability.	3. Understand and apply principles and practices from plant and soil sciences, and tropical agriculture to improve production and profitability.	3. Apply principles and practices from tropical agriculture and plant and soil sciences to improve production and profitability.
4. Apply the scientific method and available technology to understand and manage agronomic and agribusiness challenges and opportunities.	4. Apply scientific methods and information technology to manage agronomic and agribusiness challenges and opportunities.	4. Apply the scientific method and available technology to understand and manage agronomic and agribusiness challenges and opportunities.
5. Explain contemporary social, political, economic, and ethical issues involving food, agriculture and the environment.	5. Demonstrate the fundamental knowledge of the contemporary issues involving food, agriculture and the environment.	5. Explain contemporary social, political, economic, and ethical issues involving food, agriculture and the environment.
		6. Use practical hands-on field and laboratory investigation skills in plant biology and tropical agriculture.

II. Relation of Program Objectives to Functions of the College and University

The program objectives of the proposed AS in Plant Biology and Tropical Agriculture are closely aligned to the UHCC system strategic plan and the Kaua'i CC and Leeward CC strategic plans and mission statements. Additional details about each individual campus are included separately in the Kaua'i CC and Leeward CC sections. The proposed AS in Plant Biology and Tropical Agriculture program at Kaua'i CC and Leeward CC is aligned with the following UHCC system strategic plan goals.

Goal A (part 1): Educational Effectiveness and Student Success and (part 2): Native Hawaiian Educational Attainment: *Special emphasis on part-time student access and success, adult learners, and underserved populations.* Both Kaua'i CC and Leeward CC serve diverse and underserved populations on Kaua'i and O'ahu, including Native Hawaiians. The Plant Biology and Tropical Agriculture program adds to career and technical education opportunities for students of different ages and backgrounds, including many returning adult students, and part-time students.

Goal B: Functioning as a Seamless State System: Transfers and Articulation. The AS in Plant Biology and Tropical Agriculture is a joint initiative between Kaua'i CC and Leeward CC which includes common core PSLO's, and a common core curriculum between both campuses thus functioning as a seamless state system. This is likely to serve as a template for other UHCC campuses with agricultural programs.

Goal C: Promote Workforce and Economic Development: *Special emphasis on STEM, energizing workforce areas, and reviving the global curriculum.* The purpose of the AS in Plant Biology and Tropical Agriculture is to promote and support workforce and economic development in the field of agriculture and natural resource management. The program will prepare graduates for STEM-related agriculture occupations. It also provides internship opportunities for students to gain workplace experience.

Goal D: Hawaii's Educational Capital/Resources and Stewardship: *What it means to be a Native Hawaiian Serving Institution, Government/non-profit partnerships, entrepreneurship, commercialization, and resource base.* The PBT academic programs at both Kaua'i CC and Leeward CC are advised by Advisory Committees, which consist of representatives from agribusinesses, non-profit organizations engaged in agriculture, and related faculty from two-year and four-year institutions. The programs at both campuses work to develop collaborative partnerships with local agriculture entities.

III. Program Organization Relative to Objectives

Within the University of Hawai'i system, five community colleges offer academic programs in agriculture with curriculum consisting of credit certificates or 2-year degree programs. The UHCC campuses which offer academic programs in agriculture include Kaua'i CC, Leeward CC, Hawai'i CC, Maui College, and Windward CC. In addition, the University of Hawai'i at Mānoa offers academic programs at the baccalaureate and graduate level under the College of Tropical Agriculture and Human Resources (CTAHR), and the University of Hawai'i at Hilo offers baccalaureate programs under the College of Agriculture, Forestry, and Natural Resource Management (CAFNRM). Kaua'i CC and Leeward CC are proposing an AS degree program in Plant Biology and Tropical Agriculture. Currently, no other UH Community College campus offers an AS in agriculture degree program, although Hawai'i CC, and Maui College offer Associate in Applied Science (AAS) degrees. Kaua'i CC is also unique among UHCC campuses and is scheduled to offer a transfer-track Associate in Science in Natural Science (ASNS) concentration in Plant Biology and Tropical Agriculture. Several PBT courses have also been included as electives under the ASNS Life Sciences concentration at Leeward CC. In addition, all five UHCC campuses also offer a range of different certificates in agricultural subjects. The agriculture program offerings in the UHCC system are outlined in Table 3.1.

Table 3.1: Agriculture Academic Programs at University of Hawai'i Community Colleges

	Kaua'i CC	Leeward CC	Hawai'i CC	Maui College	Windward CC
Associate's Degree Program (≥60 credits)	AS Plant Biology and Tropical Agriculture <i>(proposed)</i> ASNS conc. in Plant Biology and Tropical Agriculture <i>(pending approval)</i>	AS Plant Biology and Tropical Agriculture <i>(proposed)</i>	AAS Agriculture	AAS Sustainable Tropical Crop Management AAS Horticulture and Landscape Maintenance	
Certificate of Achievement Program (24-51 credits)	CA Plant Biology and Tropical Agriculture <i>(proposed)</i>	CA Plant Biology and Tropical Agriculture <i>(proposed)</i>	CA Agriculture	CA Sustainable Tropical Crop Management CA Horticulture and Landscape Maintenance CA Floriculture Management CA Landscape Management	CA Agripharmatech
Certificate of Competence Program (4-23 credits)	CO Plant Biology and Tropical Agriculture <i>(proposed)</i>	CO Plant Biology and Tropical Agriculture <i>(proposed)</i>	CO Farm Worker CO Landscape Worker	CO Nursery Production CO Pest Management CO Agricultural Science CO GIS Ecosystem Management CO Turfgrass Specialist CO Sustainable Crop Production CO Landscape Maintenance	CO Agricultural Technology CO Subtropical Urban Tree Care CO Plant Landscaping

Academic Subject Certificate (≥12 credits)	ASC Plant Biology and Tropical Agriculture	ASC Plant Biology and Tropical Agriculture ASC Community Food Security			ASC BioResources and Technology: Plant Biotechnology
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Both Kaua'i CC and Leeward CC have an already existing joint Academic Subject Certificate (ASC) in Plant Biology and Tropical Agriculture which is based on common curriculum. The curriculum for the proposed AS in Plant Biology and Tropical Agriculture builds upon the joint ASC curriculum and is closely aligned between the two campuses. The proposed AS in Plant Biology and Tropical Agriculture is organized around a subject concentration core consisting of general science courses such as chemistry, biology and PBT concentration courses covering topics such as plant propagation, integrated pest management, crop improvement, and soil science. Both campuses also require successful completion of an experiential learning internship project. In addition, the AS in Plant Biology and Tropical Agriculture also requires general education courses consisting of the UH system core of foundations and diversification designated courses.

Minor differences between campuses reflect individual campus sub-concentrations that are not included in the common core curriculum. For example, PBT 275 Introduction to Crop Improvement, which is an introductory genetics course is a required course at Kaua'i CC; whereas, at Leeward CC, students may select between PBT 275, and two ornamental horticulture courses which are not currently offered at Kaua'i CC. Leeward CC also offers PBT 112 which is related to a separate Leeward CC campus-specific ASC program in Community Food Security and is not related to the existing joint-campus ASC in Plant Biology and Tropical Agriculture. Kaua'i CC does not intend to offer the second ASC program or its associated PBT 112 course. In addition, Kaua'i CC also offers PBT 204 which is an introductory soil science course with a chemistry pre-requisite, which is designed to articulate with similar courses in baccalaureate programs in connection with the transfer-track ASNS concentration at Kaua'i CC. The proposed curriculum from Kaua'i CC and Leeward CC is outlined in Table 3.2.

Table 3.2: Proposed AS Plant Biology and Tropical Agriculture Curriculum at Kaua'i CC and Leeward CC

Kaua'i Community College		Leeward Community College	
Subject Concentration		Subject Concentration	
Course	Credits	Course	Credits
BOT 101 General Botany or BIOL 171/171L Introduction to Biology I (Diversification DB/DY)	4	BOT 101 General Botany or BIOL 171/171L Introduction to Biology I or BIOL 101 Biology for Non-majors (Diversification DB/DY)	4
HORT 200 Introduction to Horticulture	3	PBT 200/200L Introduction to Plant Science	4
PBT 264 Plant Propagation	3	PBT 264 Plant Propagation	3
PBT 141 Integrated Pest Management	3	PBT 141 Integrated Pest Management	3
PBT 275 Introduction to Crop Improvement	3	Any of the following courses: PBT 250 Tropical Landscaping or PBT 269 Ornamental Plant Materials or PBT 275 Introduction to Crop Improvement	3-6
PBT 290V Plant Biology and Tropical Agriculture Internship	3	PBT 290V Plant Biology and Tropical Agriculture Internship	1-4
PBT 100 Introduction to Hawai'i's Agriculture Industry	1	PBT 100 Introduction to Hawai'i's Agriculture Industry	1
BOT 130/ 130L Plants in the Hawaiian Environment	4	BOT 130/ 130L Plants in the Hawaiian Environment or HORT 110 Hawai'i Horticulture & Nutrition	4
PBT 204 Fundamentals of Tropical Soil Science or PBT 122 Soil Technology	3-4	PBT 122 Soil Technology	3
CHEM 151/151L Survey of Chemistry or CHEM 161/161L General Chemistry I (Diversification DP/DY)	4	CHEM 151/151L Survey of Chemistry or CHEM 161/161L General Chemistry I (Diversification DP/DY)	4
		AG 112 Introduction to Organic Agriculture	4
Subject Concentration Sub-Total:	31-32	Subject Concentration Sub-Total:	37
General Education		General Education	
Course	Credits	Course	Credits
Foundation FW Communication: ENG 100 Composition or any FW designated course	3	Foundation FW Communication: ENG 100 Composition or any FW designated course numbered 100 or above	3
Foundation FS Symbolic Reasoning: MATH 115 Statistics or any FS designated MATH course	3	Foundation FS Symbolic Reasoning: MATH 100 Survey Math or MATH 103 College Algebra or any higher FS designated course	3
Foundation FG (6) Two courses from different time periods (FGA, FGB, or FCC)	6	Foundation FG (6) HIST 151 World History I and/or other FG courses	6
Diversification Literature, Arts, or Humanities: Any DA, DL, or DH designated course	3	Diversification Literature, Arts, or Humanities: HWST 107 Hawai'i: Center of the Pacific /or other DA/DH/DL courses	3
Diversification Social Science: BOT 105 Ethnobotany or any DS designated course	3	Diversification Social Science: SOC 151 Introduction to the Sociology of Food or other DS courses	3
General Education Sub-Total	18	General Education Sub-Total	18
Other Requirements		Other Requirements	
Course	Credits	Course	Credits
Electives – Any courses numbered 100 or higher.	10-11	MGT 135 Agriculture Entrepreneurship in Hawai'i or MGT 125 Starting a New Business, or BUSN 164 Career Success	3
		ICS 101 Digital Tools for the Information World or BUS 101 Business Computer Systems	3
		GEOG 101 Natural Environment or PBT 210 Introduction to Environmental Science	3
Other Requirements Sub-Total	10-11	Other Requirements Sub-Total	9
Total Credits	60	Total Credits	64

IV. Program Enrollment

All campuses in the UHCC system, including Kaua'i CC and Leeward CC have an open-door access policy and serve diverse populations of students on Kaua'i and O'ahu. The total student enrollment of Leeward CC is approximately 8,000 students, and the total student enrollment of Kaua'i CC is around 1,500 students. Geographically, Leeward CC is located on the Leeward side of O'ahu that has the greatest density of agriculture and conservation lands. Kaua'i CC is the only institution of post-secondary education which serves students in Kaua'i County which also has a high concentration of agricultural industries. There is a workforce demand for agricultural graduates specifically on the islands of Kaua'i and O'ahu. The program provides an educational program to meet the workforce demands. Table 4.1 provides additional information on workforce demands for various agricultural occupations at the national, state, and county levels.

Table 4.1: National, State, and County Employment Projections for Agricultural Occupations

	Total All Occupations		Individual Occupations			Comparison
	Life, Physical, Social Science Technicians	Farming, Fishing, Forestry Occupations	Farmers, Ranchers, Agricultural Managers	Agricultural Technicians	Supervisors of Farming, Fishing, Forestry Workers	Plant and Soil Scientists
SOC Code	19-4000	45-0000	11-9013	19-4011	45-1000	19-1013
Preparation	Associates	High School	High School	Associates	High School	Bachelors
Mean National Salary	\$41,130	\$19,370	\$69,300	\$34,070	\$43,500	\$58,740
National						
2012	366,800	947,200	930,600	25,900	45,900	16,300
2022	401,800	915,000	750,700	26,100	44,800	17,600
% Growth	9.5%	-3.4%	-19.3%	2.9%	-2.5%	7.5%
State of Hawai'i						
2010	1,960	4,500	5,850	180	280	16,300
2020	1,990	4,750	5,530	200	300	17,600
% Growth	1.7%	5.7%	-5.4%	9.6%	5.3%	7.5%
Kaua'i County						
2010	130	520	540	50	30	140
2020	140	540	510	60	30	160
% Growth	2.2%	3.4%	-4.5%	11.8%	0%	11.4%
Honolulu MSA						
2010	1,220	1,580	1,510	80	70	40
2020	1,270	1,690	1,450	90	80	50
% Growth	3.7%	6.7%	-4.2%	9.2%	6.9%	14.3%

Sources:

U.S. Dept. of Labor, Bureau of Labor Statistics: http://www.bls.gov/emp/ep_data_occupational_data.htm

Hawaii Workforce Infonet: <https://www.hiwi.org/gsipub/index.asp?docid=423>

The proposed Plant Biology and Tropical Agriculture programs at Kaua'i CC and Leeward CC will recruit students from a range of diverse backgrounds including local high school graduates, returning adult students and veterans seeking to re-enter the workforce or change careers, and current agricultural industry employees seeking to gain further education, skills, or promotion. The PBT program is designed to provide flexibility to meet a range of different student needs, by offering multiple certificate and associate degree options. Courses or certificates can also be taken as general education diversification requirements, electives, or concentrations for students enrolled in other programs. Both campuses provide student counseling and advisement to assist students in meeting their educational goals.

V. Resource Requirements for Implementation and First Cycle of Operation

Kaua'i CC and Leeward CC currently have Academic Subject Certificate (ASC) programs in Plant Biology and Tropical Agriculture. The current proposed AS in Plant Biology and Tropical Agriculture at both campuses is an expansion of the existing programs, and will rely on already existing courses, equipment, and facilities. However, both Kaua'i CC and Leeward CC are both requesting one additional FTE BOR faculty per campus to support the program expansion and Leeward CC is requesting one FTE APT.

Table 5.1: Projected Student Headcount for Kaua'i CC and Leeward CC

	2014-2015	2015-2016	2016-2017
Kaua'i CC	20	40	40
Leeward CC	20	45	50

The following resource requirements are described in more detail in the cost and revenue tables which are located in the individual campus sections for Kaua'i CC and Leeward CC.

The **headcount enrollment** (A) and **annual SSH** (B) are calculated based on the projected number of students pursuing an AS in Plant Biology and Tropical Agriculture.

The calculation of **instructional costs** without fringe (C) is based upon average yearly salary of Math & Science instructors multiplied by the FTE and applying UHPA collective bargaining increases where appropriate. We assumed an increase of 3% per year.

Other personnel costs (D), and **unique program costs** (E) are calculated following standard academic cost and revenue worksheet template. The other personnel costs include a requested APT for Leeward CC. The unique program costs include additional instructional supplies and consumables.

Revenue generated by **tuition** (G) is based on the number of SSH multiplied by the applicable tuition. The tuition was based on the UHCC *Proposed Tuition Schedule* (available: <http://www.Hawai'i.edu/offices/app/>).

The **instructional cost with fringe** (K1) is based on the average Math & Science instructor's salary multiplied by the FTE for the program.

The **support costs** (L) and **total campus expenditures** (N) are estimated from <http://www.Hawai'i.edu/cgi-bin/iro/maps?esuhfy1011.pdf>.
The programs used for comparison (O), are Leeward CC's AS in NS taken for the above Expenditures Report and Maui College's Agriculture program taken from the 2013 APRD.

Table 5.2: Estimated Instructional Cost per SSH

	2014-2015	2015-2016	2016-2017
Kaua'i CC	\$293	\$151	\$155
Leeward CC	\$120	\$89	\$83

Table 5.3: Estimated Net Revenue

	2014-2015	2015-2016	2016-2017
Kaua'i CC	-\$63, 600	\$8,500	\$14,084
Leeward CC	-\$28, 466	\$24,580	\$50,965

VI. Program Efficiency

The Plant Biology and Tropical Agriculture program at Kaua'i CC and Leeward CC will measure program efficiency using the University of Hawai'i Community College Instructional Annual Report of Program Data (APRD). The APRD measures program health based on the following criteria of demand indicators and efficiency indicators.

Table 6.1: Demand and Efficiency Indicators

Demand Indicators	Efficiency Indicators
New and Replacement Positions	Average Class Size
Number of Majors	Fill Rate
SSH Program Majors in Program Classes	FTE BOR Appointed Faculty
SSH Non-Majors in Program Classes	Majors to FTE BOR Appointed Faculty
SSH in All Program Classes	Majors to Analytic FTE Faculty
FTE Enrollment in Program Classes	Analytic FTE Faculty
Total Number of Classes Taught	Overall Program Budget Allocation
	General Funded Budget Allocation
	Cost per SSH
	Number of Low-Enrolled Courses

VII. Program Effectiveness

The program effectiveness at both Kaua'i CC and Leeward CC will be measured by the UHCC Annual Review of Program Data, ARPD, which includes the following achievement data and indicators of program effectiveness.

- Successful completion (equivalent to "C" or higher)
- Withdrawals (Grade = "W")
- Persistence (Fall to Spring)
- Degree/ Certificates awarded
- Transfer to UH 4-year



I. Program Objectives

The proposed AS program in Plant Biology and Tropical Agriculture at Kaua'i Community College (Kaua'i CC) is designed to meet both employer and employee needs. The program objectives and program student learning outcomes are aligned with local educational and workforce needs. Students graduating from the program in Plant Biology and Tropical Agriculture will qualify for a range of different careers in agriculture, promotion, or further educational pursuits.

A. Kaua'i CC Program Student Learning Outcomes

Students graduating from the Plant Biology and Tropical Agriculture program will be able to:

1. Use appropriate scientific and agricultural terminology to communicate in different settings and with different audiences.
2. Identify and analyze the biotic and abiotic factors that affect agricultural production and describe how these factors are managed at the local, state, national, and global level.
3. Apply principles and practices from tropical agriculture and plant and soil sciences to improve production and profitability.
4. Apply the scientific method and available technology to understand and manage agronomic and agribusiness challenges and opportunities.
5. Explain contemporary social, political, economic, and ethical issues involving food, agriculture, and the environment.
6. Use practical hands-on field and laboratory investigation skills in plant biology and tropical agriculture.

B. Program Educational Objectives

A recent report from the National Science Foundation on the characteristics of graduates completing either a baccalaureate or master's degree in science, engineering, or health fields highlights the increasing importance of community college education to STEM

fields (Lan, 2012; Mooney and Foley, 2011). Overall in 2008, 52% of all baccalaureate STEM graduates reported community college attendance at some point during their academic training, and 16% of graduates reported holding an associate's degree (Lan, 2012). The importance of community college education was even more pronounced when looking specifically at agriculture baccalaureate degree graduates, as 60% reported having attended community college at some point, and 17.9% reported having an associate degree (Lan, 2012). Results from the 2008 NSF survey indicated that for agriculture baccalaureate graduates the most common reasons for community college attendance included earning credits for a baccalaureate program, college preparation or improving college acceptance chances, financial reasons, earning an AS, or furthering skills or knowledge for occupation (Lan, 2012).

Reasons for attending Kaua'i CC are aligned with national trends, and as the only institution of higher education on Kaua'i, the role of Kaua'i CC in educating Kaua'i residents is particularly pronounced. For example, due to personal or professional circumstances, many Kaua'i residents do not have the option of relocating for educational purposes. The AS program in Plant Biology and Tropical Agriculture at Kaua'i CC will allow individuals to pursue further education while remaining on Kaua'i. For example, agriculture professionals can remain in their current employment positions on Kaua'i while enrolled in the Plant Biology and Tropical Agriculture program at Kaua'i CC.

The individual courses of the Plant Biology and Tropical Agriculture program are designed to provide a relevant science and evidence-based foundation in science and agriculture. The educational objectives of the program seek to develop an understanding and application of relevant scientific and agricultural terminology and the scientific method. Other objectives include understanding and evaluating the abiotic and biotic factors that affect agricultural production and their management on a regional, national, and global scale in order to improve production and profitability. The Plant Biology and Tropical Agriculture program also has a strong focus on experiential learning and includes a requirement of participating in an internship with an employer or conducting an independent research project with a faculty member. In addition, almost all of the individual Plant Biology and Tropical Agriculture courses include laboratories for hands-on experimentation and skill development.

Kaua'i CC has had a 22 credit Academic Subject Certificate (ASC) in Plant Biology and Tropical Agriculture since 2012. However, there is a further educational demand by employers and students for an associate's level degree program in the agriculture discipline as evidenced by letters of support from agricultural employers in Appendix B,

and results from student surveys in Figure 1.2 below. The only option for students intending to earn an associate’s degree has thus far been to complete the ASC as a concentration under the Liberal Arts, AA degree, or to enroll in the biological science concentration under the Associate of Science in Natural Science (ASNS) degree. However, there is a demand to earn a specialized associate’s degree in the agriculture discipline as evidenced by student feedback. An AS program in Plant Biology and Tropical agriculture would allow agriculture students to earn an AS in their discipline, allowing greater specialization, rather than having to enroll in a more general associate’s degree program and avoiding the need to complete additional courses in order to fulfill differing ASC and AA degree requirements.

Kaua’i CC is also proposing to offer two different associate degree tracks to meet the different educational needs of students either intending to earn a terminal AS degree, or intending to transfer to a baccalaureate program, as indicated in Figure 1.1. The proposed AS degree program is designed to meet the needs of students intending to earn a terminal AS degree. An additional ASNS concentration in Plant Biology and Tropical Agriculture at Kaua’i CC is designed to provide an educational pathway for seamless transfer to a baccalaureate program in agriculture.

Students currently enrolled in the Plant Biology and Tropical Agriculture ASC program completed a survey regarding their intended academic program enrollment and career goals. The results of the survey are included in Figure 1.2. The survey results indicated that 89% of student respondents reported an interest in enrolling in associate’s degree program. Specifically, 33% of students reported an interest in enrolling in and completing the AS in Plant Biology and Tropical Agriculture when offered, and 33% expressed interest in enrolling in the ASNS concentration in Plant Biology and Tropical Agriculture.

Figure 1.1: Survey Results of Current ASC Plant Biology and Tropical Agriculture Students’ Intended Educational Goals Following Kaua’i CC

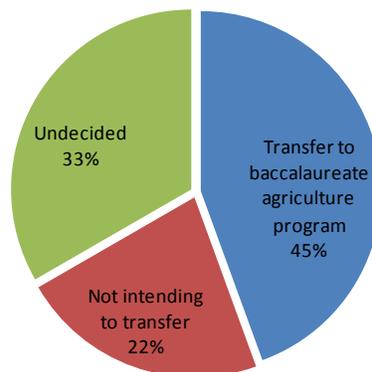
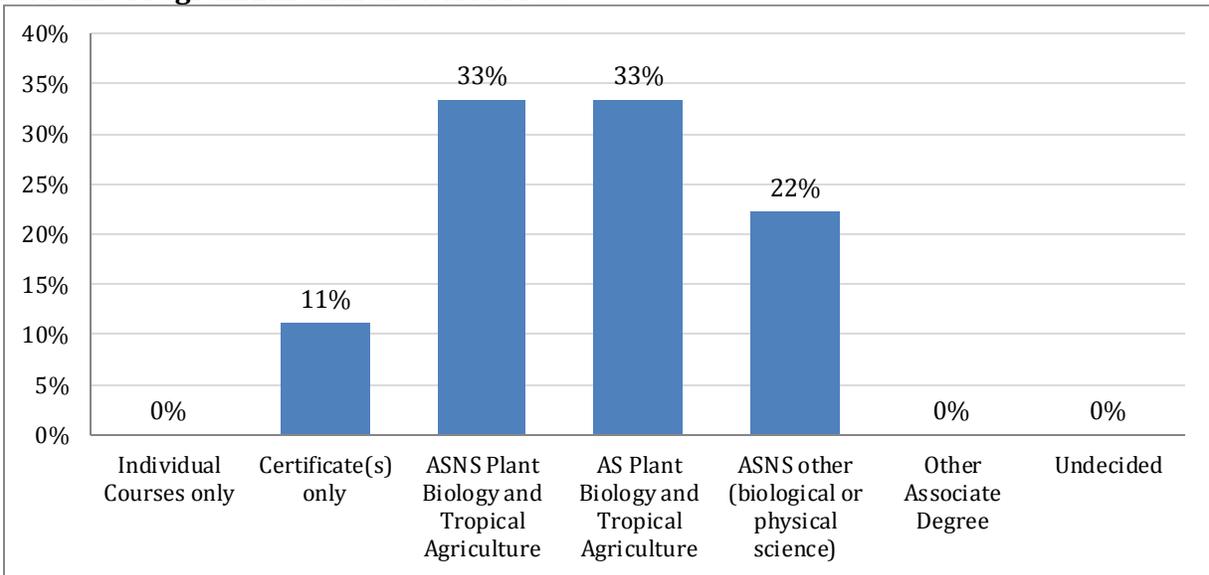


Figure 1.2: Survey Results of ASC Plant Biology and Tropical Agriculture Students' Intended Academic Program Enrollment at Kaua'i CC



Note for Figures 1.1 and 1.2: n=9, ~50% student response rate.

Kaua'i CC is also proposing a Certificate of Achievement (CA) and a Certificate of Competence (CO) in connection with the AS degree, in addition to the ASC which can be taken as a concentration of the Liberal Arts, AA degree. The certificates provide flexibility in educational options to meet a range of different educational needs for career development or life-long learning. The certificates may also be taken as part of a career ladder or stackable certificate program in which certificates and later an AS degree can be sequentially earned.

In addition, students may enroll in any individual courses in the Plant Biology and Tropical Agriculture program for professional development or personal interest. Individual courses may also be taken by students in other academic programs in order to learn more about agriculture, or earn a certificate concentration in agriculture. The term "agricultural literacy" in relation to the need to develop a basic understanding of agriculture for all members of society was first used in a National Research Council report, which very accurately stated that: "Agriculture is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture," (National Research Council, 1988). The report further referenced "disturbing trends" regarding a lack of basic or fundamental knowledge about agriculture within the U.S. along with common misconceptions about the discipline of agriculture (National Research Council, 1988). More than two decades after the term was first introduced, the repercussions of the lack of "agricultural literacy" are especially poignant for Kaua'i and the state of Hawai'i,

which have recently experienced conflicts and political divides over agriculture. The current situation highlights the importance of developing “agriculture literacy” and wider-scale education about agriculture.

C. Program Workforce Development Objectives

Developing a more diverse economy is a crucial goal of both Kaua‘i and the state of Hawai‘i. The unique tropical environment of Kaua‘i and the state allows for year-round growing, and the cultivation of tropical specialty crops which along with the availability of agricultural lands make Kaua‘i and the state an ideal location for agricultural development. However, the development of any industry depends on the availability of qualified employees. The proposed AS program in Plant Biology and Tropical Agriculture will have a role in educating the workforce needed to meet employer needs and further support the development of an agricultural sector on Kaua‘i and the state.

Kaua‘i CC is located in an ideal location conducive to agriculture, and career opportunities exist for graduates of the Plant Biology and Tropical Agriculture program with agricultural stakeholders on Kaua‘i. Four out of the five major agricultural seed companies are located on Kaua‘i, along with the largest coffee farm in the U.S., the National Tropical Botanical Garden headquarters, and multiple smaller diversified agriculture operations. There is a high demand for skilled agriculture employees to meet the employment needs of agriculture stakeholders on Kaua‘i, and this program is designed to produce agriculture graduates to meet this demand. Additional information about Hawai‘i projected job growth in the agricultural sectors is available in Tables 1.1 and 1.2.

Table 1.1: State of Hawai‘i Projected Agricultural Occupation Outlook

Occupation	CIP	SOC	2013 Jobs	2019 Jobs	Changes	New and replacement positions	Annual Openings
Farmers, Ranchers, Other Agricultural Managers	1.1101	11-9013	383	382	-1	48	8
Soil and Plant Scientists	1.1101	19-1013	88	94	6	24	4
First-Line Supervisors of Farming, Fishing, and Forestry Workers	1.1101	45-1011	260	263	3	40	7
Agricultural and Food Science Technicians	41.0000	19-4011	109	112	3	27	4
Life, Physical, and Social Science Technicians (Other)	41.0303	19-4099	545	560	3	40	7

Source: Kaua‘i CC Institutional Researcher

Table 1.2: Earnings by Agricultural Occupation for State of Hawai‘i

Occupation	Preparation	Median Hourly Earnings	10th Percentile Hourly Earnings	25th Percentile Hourly Earnings	75th Percentile Hourly Earnings	90th Percentile Hourly Earnings
Farmers, Ranchers, Other Agricultural Managers	High School	\$15.11	\$8.38	\$10.22	\$19.20	\$23.80
Soil and Plant Scientists	Bachelor’s Degree	\$29.52	\$17.90	\$23.00	\$36.91	\$45.91
First-Line Supervisors of Farming, Fishing, and Forestry Workers	High School	\$17.36	\$15.49	\$16.19	\$18.52	\$20.98
Agricultural and Food Science Technicians	Associate’s Degree	\$24.13	\$14.07	\$17.80	\$31.17	\$38.38
Life, Physical, and Social Science Technicians (Other)	Associate’s Degree	\$20.41	\$15.60	\$16.93	\$27.53	\$37.03

Source: Kaua‘i CC Institutional Researcher

Discussions with agricultural employers on Kaua‘i have identified the need for a more skilled labor force with a minimum AS level of technical and scientific training, or even more ideally with a BS degree. However, currently there is a lack of locally available individuals with technical and scientific training to meet the needs of major agricultural employers on Kaua‘i. An AS program in Plant Biology and Tropical Agriculture is needed on Kaua‘i in order to meet the needs of Kaua‘i agricultural stakeholders and also to provide students with access to higher wage careers, promotion, or further academic pursuit of a BS degree. Additional documentation from agricultural stakeholders on Kaua‘i is available in Appendix B: Letters of Support.

Table 1.3 shows the agriculture related national employment outlook for community college graduates with a certificate or associates degree. A diverse range of agriculture-related employment opportunities exist for certificate or AS degree graduates including agricultural and food science technicians, precision agriculture technicians, agricultural inspectors, greenhouse and nursery managers, first-line supervisors of workers, and purchasing agents. The job mobility and national median yearly income for community college graduates far exceeds that of workers without any post-secondary education (Table 1.3). For example, careers such as field technicians or occupations involving management and supervisory roles often require some college or an AS degree as minimum qualifications, and these jobs typically pay in the \$34,000 - \$69,000 range. In contrast, occupations such as farm laborers which do not require any post-secondary preparation and are often filled by individuals with high school diplomas or less typically pay around \$18,000.

Table 1.3: Agriculture-Related National Occupational Employment Outlook for Graduates With or Without Certificates or AS Degree.

Occupation	CIP Code	2010 Employment	2010-2020 Projected Job Openings	2010-2020 Projected Job Growth	Median Annual Wage, 2010	Employee Educational Level, 2010	Job Zone Preparation Required
Occupational Outlook with for Graduates with an AS or Certificate							
Greenhouse and Nursery Managers	11-9013.01	1,203,000	234,500	-3 to -9%	\$69,300	Some College (27%); AS (24%); BS (45%)	Three: Medium Preparation Needed (vocational schools, job experience, or associates)
Precision Agriculture Technicians	19-4099.02	62,000	33,500	10% to 19%	\$43,130	Some College (21%); AS (25%); BS (43%)	Three: Medium Preparation Needed (vocational schools, job experience, or associates)
Agricultural Technicians	19-4011.01	21,000	8,700	3 to 9%	\$34,070	High School (25%), Some College (25%), BS (36%)	Three: Medium Preparation Needed (vocational schools, job experience, or associates)
Buyers and Purchasing Agents, Farm Products	13-1021.00	13,000	3,200	3 to 9%	\$55,720	High School (44%), Some College (30%), BS (20%)	Three: Medium Preparation Needed (vocational schools, job experience, or associates)
Agricultural Inspectors	45-2011.00	19,000	6,000	-2 to 2%	\$42,160	High School (36%); Some College (12%); BS (36%)	Three: Medium Preparation Needed (vocational schools, job experience, or associates)
First-Line Supervisors of Landscaping, Lawn Service, Groundskeeping Workers	37-1012.00	203,000	60,100	10 to 19%	\$42,160	High School (55%); Some College (11%); AS (33%)	Two: Some Preparation Needed (high school diploma)
First-Line Supervisors of Agricultural Crop and Horticultural Workers	45-1011.07	47,000	13,600	-2 to 2%	\$43,660	High School or less (65%); Bachelor's Degree (18%)	Two: Some Preparation Needed (high school diploma)
Occupational Outlook Without an AS or Certificate							
Nursery Worker	45-2092.01	746,000	227,400	-3 to -9%	\$18,670	Less than high school (23%); High School (57%)	One: Little or No Preparation Needed (high school diploma or GED)
Landscaping and Groundskeeping Workers	37-3011.00	1,152,000	444,400	20 to 28%	\$23,570	Less than high school (52%); High School (26%); Some College (16%)	One: Little or No Preparation Needed (high school diploma or GED)
Farmworkers and Laborers, Crop	45-2092.02	746,000	227,400	-3 to -9%	\$18,670	N/A	One: Little or No Preparation Needed (high school diploma or GED)

Employment data source: O*Net Online: <http://www.onetonline.org/>

The majority of students in the Plant Biology and Tropical Agriculture program are current agriculture employees and are primarily employed by the seed industry on Kaua'i, and are enrolled in the program in order to gain promotion in the seed industry. The seed industry is a major stakeholder in the agricultural sector on Kaua'i and in the state of

Hawai'i. The seed industry accounts for 20.2% of all agricultural jobs for the state of Hawai'i, and 28.2% of all agricultural labor income for the state (Loudat and Kasturi, 2013). Typically, salaries in the seed industry are 34-36% higher than for similar positions in other segments of the agriculture sector, and 14% of positions in the seed industry are classified as high tech compared to the 5% state-wide average (Loudat and Kasturi, 2013). Graduates of the Plant Biology and Tropical Agriculture program will have many opportunities for high-salary and high-tech STEM positions in Kaua'i County and Hawai'i.

Kaua'i CC also has an Agriculture Advisory Committee which is made up of agriculture stakeholders and employers on Kaua'i. The Advisory Committee provides relevant feedback on local workforce development and employment needs in relation to program curriculum. In addition, students in the Plant Biology and Tropical Agriculture program have the option of gaining relevant experience by participating in an internship project with agricultural employers or organizations.

A survey was conducted to collect data on the intended career goals of current Plant Biology and Tropical Agriculture students. The results are illustrated in Figures 1.3 and 1.4 and indicated that 67% of students were intending to earn a promotion with their current employer, 22% were intending to start or change careers, and 11% were interested in starting or continuing a business. The curriculum of the Plant Biology and Tropical Agriculture program is designed to provide flexibility to accommodate individual student career goals. For example, students intending to start a business can take business or accounting courses as program electives, or students seeking multiple internships with different employers may take additional internship credits as electives.

Figure 1.3: Survey Results of ASC Plant Biology and Tropical Agriculture Students' Intended Agriculture Employment Sector

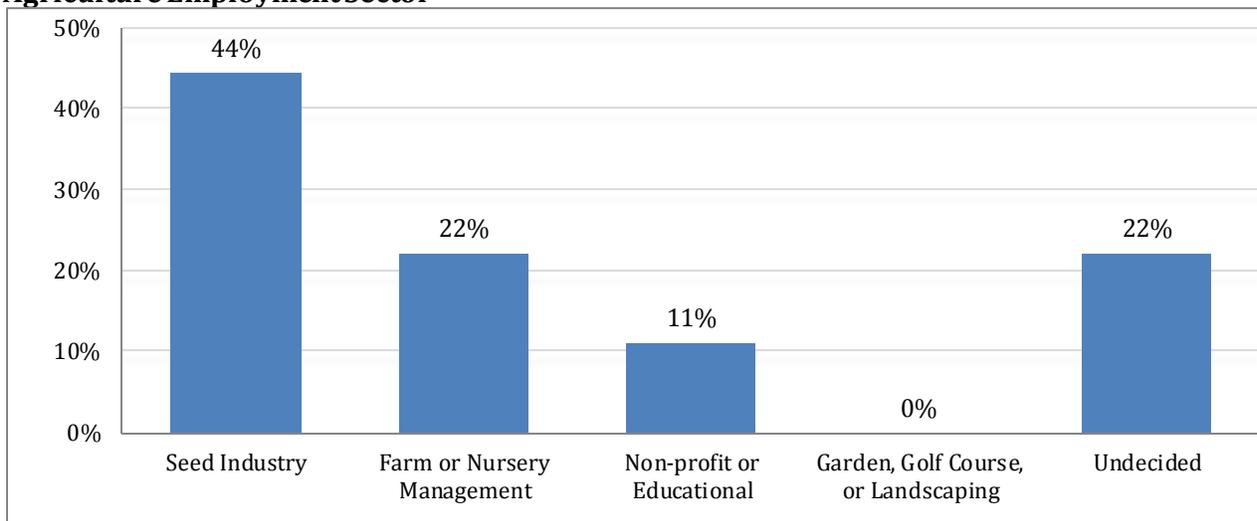
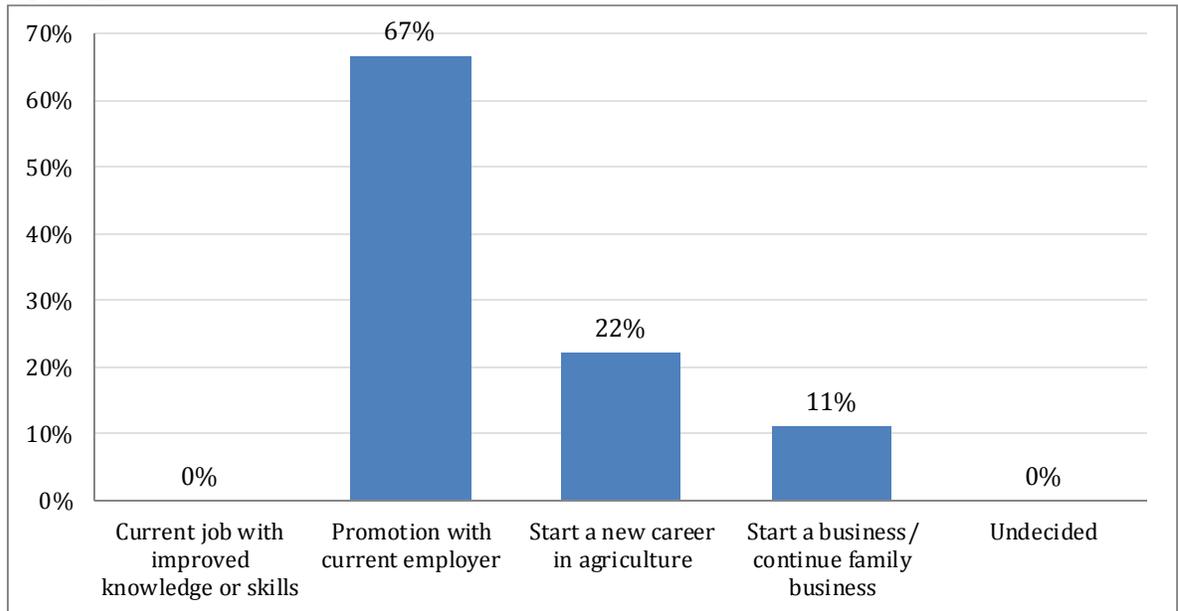


Figure 1.4: Survey Results of ASC Plant Biology and Tropical Agriculture Students' Intended Career Goals



Note Figures 1.3 and 1.4: n=9, ~50% survey response.

II. Relation of Program Objectives to Functions of the College and University

A. Relation of Program Objectives to UHCC and Kaua'i CC Strategic Plans:

The objectives of the proposed AS in Plant Biology and Tropical Biology are closely aligned with the UHCC 2008-2015 and proposed 2015-2020 Strategic Plans and the Kaua'i CC 2008-2015 Strategic Plan, both of which are aligned with the UH System Strategic Plan. The relation of the Plant Biology and Tropical Agriculture Program Objectives and the UHCC and Kaua'i CC Strategic Plans are outlined in Table 2.1.

Educational Effectiveness, Access, and Student Success: *UHCC Goal A: Educational Effectiveness and Student Success and Native Hawaiian Educational Attainment and Focus Area 1: Infrastructure for Student Learning and Student Success; and Kauai CC Goal 1: Access to Educational Excellence for a Diverse Student Population.* The Plant Biology and Tropical Agriculture program addresses the UHCC and Kaua'i CC goals of educational effectiveness, access, and student success. The enrollment in the Plant Biology and Tropical Agriculture currently consists of returning adult students from diverse backgrounds, many who are working full-time in the agriculture industry, while pursuing part-time education in the evenings. The unique needs of this diverse target population will be taken into account and

current initiatives such as scheduling courses in the evenings will be continued in order to support student success and retention.

Learning and Teaching as a Seamless State System: *UHCC Goal B: Functioning as a Seamless State System; and Kaua'i CC Goal 2: Learning and Teaching to Promote Excellence for Transfer, Career, and Life-Long Learning.* The AS degree and CA are designed to provide relevant knowledge and skills needed by the agriculture industry, and graduates will be prepared for career entry or promotion within existing positions. The CO would also provide general knowledge for life-long learning. Although not the subject of this full proposal, an additional ASNS concentration in Plant Biology and Tropical Agriculture will accommodate students intending to transfer to related 4-year College of Agriculture programs at UH Mānoa or UH Hilo.

Workforce Development: *UHCC Goal C: Workforce Development with an Emphasis on STEM Workforce; and Kaua'i CC Goal 3: Workforce Development for Employment and Future Career Development.* The AS in Plant Biology and Tropical Agriculture functions to provide educational training in agriculture, and graduates of the program will qualify for technical STEM related careers in agriculture.

Partnerships: *UHCC Goal D: Hawaii's Educational Capital/ Resources and Stewardship; and Kaua'i CC Goal 5: Community Development through Campus Leadership and Collaboration.* The Plant Biology and Tropical Agriculture program at Kaua'i CC is designed to meet both employer and employee needs and is supported by an Agriculture Advisory Committee to provide guidance and review of the program curriculum. An experiential learning component in the form of either an independent research project or an internship project with an employer is also a requirement of the AS, ASNS, and CA in Plant Biology and Tropical Agriculture. It is anticipated that collaboration and partnerships with local industry and organizations will be utilized for internship projects.

Table 2.1: Relation between AS Plant Biology and Tropical Agriculture Program Objectives and UHCC and Kaua'i CC Strategic Plans:

UHCC Strategic Plan Goals	Kaua'i CC Strategic Plan Goals	Relation to Plant Biology and Tropical Agriculture Objectives
<p>Goal A (part 1): Educational Effectiveness and Student Success</p> <p>Special emphasis on Part-time student access and success Adult Learners</p> <p>Goal A (part 2): Native Hawaiian</p>	<p>Goal 1: Access – To provide open access to educational excellence for a diverse student population</p> <p>1.1 Outreach</p> <p>1.2 Enrollment and Retention</p>	<ul style="list-style-type: none"> • Enrollment in Kaua'i CC Plant Biology and Tropical Agriculture is projected to be largely composed of full-time working professionals pursuing education on a part-time basis • Enrollment in Kaua'i CC Plant Biology and Tropical Agriculture is projected to be composed of students from diverse

<p>Educational Attainment</p> <p>Including review of other underserved populations</p> <p>Focus Area 1: Distance Education</p> <p>Infrastructure for Student Learning ADA delivery Rigor Student Success</p>	<p>1.3 Placement and Scheduling</p>	<p>backgrounds, including Native Hawaiians and other underrepresented populations, and also primarily including returning adult learners</p> <ul style="list-style-type: none"> To support student success, retention, and infrastructure for student learning, all PBT concentration courses are scheduled during the evening, and additional measures are currently being evaluated to further support part-time students who are working professionals
<p>Goal B: Functioning as a Seamless State System</p> <p>Transfers and Articulation</p>	<p>Goal 2: Learning & Teaching – To promote excellence in learning and in teaching for transfer, career/ technical, remedial/ developmental education and life-long learning</p> <p>2.1 Articulation 2.2 Curriculum: quality, relevance, currency, appropriate for diverse population</p>	<ul style="list-style-type: none"> The Kaua'i CC PBT curriculum provides a relevant and current foundation in agriculture and plant biology topics. The AS and certificates are designed to prepare graduates for career entry or promotion in the agriculture industry Certificates, such as the CO would be appropriate for gaining knowledge for life-long learning. Individual courses are designed to articulate with baccalaureate programs. An ASNS concentration in Plant Biology and Tropical Agriculture exists for transfer to baccalaureate programs in agriculture at UH Mānoa or UH Hilo.
<p>Goal C: Promote Workforce and Economic Development</p> <p>Special emphasis on STEM Workforce – Energizing areas Reviving the global curriculum</p>	<p>Goal 3: Workforce Development –</p> <p>To provide a trained workforce by offering programs that prepare students for both employment and future career development.</p> <p>3.1 Articulate programs with workforce needs 3.2 Increase rates of student certification, licensure, job placement and/or transfer to appropriate baccalaureate programs.</p>	<ul style="list-style-type: none"> AS in Plant Biology and Tropical Agriculture program objectives are to meet employer needs and provide for an educated and skilled workforce for the agriculture industry, with a focus on STEM-related agriculture careers. AS and certificate graduates will be qualified for job placement or promotion within the agriculture industry. AS and ASNS graduates will qualify for transfer to baccalaureate agriculture programs.
<p>Goal D: Hawaii's Educational Capital/Resources and Stewardship</p> <p>What it means to be a Native Hawaiian Serving Institution Government/non-profit partnerships Entrepreneurship, commercialization, resource base</p>	<p>Goal 5: Community Development – To contribute to community development and enrichment through campus leadership and collaboration.</p> <p>5.1 Establish active collaborative arrangements to support community goals and needs</p>	<ul style="list-style-type: none"> AS program includes an internship component, and collaborative partnerships with local employers are in development. The PBT program is overseen and supported by an agriculture industry advisory committee Program objectives are designed to meet industry employer and employee needs.

B. Relation of Program Objectives to UHCC and Kaua'i CC Mission Statements

The objectives of the proposed Plant Biology and Tropical Agriculture academic program are also aligned with the UHCC and Kaua'i CC Mission Statements. Details regarding specific aspects of the UHCC and Kaua'i CC Mission Statements that are covered by the objectives of the PBT program are outlined below and summarized in Table 2.2.

Educational Access and Support: The objectives of the Plant Biology and Tropical Agriculture program address aspects of the UHCC and Kaua'i CC Mission Statements relating to educational access and support. As a neighbor island, the physical isolation from other UH or mainland academic institutions provides a barrier to educational access, especially for populations which may be unable to relocate due to professional or personal obligations on Kaua'i. A locally available academic program in Plant Biology and Tropical Agriculture would provide access to agriculture education on Kaua'i. Educational access and support are particularly important for current agriculture industry employees as it provides an option for industry professionals to remain in their employment positions on Kaua'i while pursuing their education at Kaua'i CC part time in the evenings.

Curriculum, Learning, and Teaching: The AS in Plant Biology and Tropical Agriculture academic program at Kaua'i CC provides current science and evidence-based concentration courses in agriculture along with a general education foundation. The curriculum is aligned with industry needs and workforce development.

Workforce Development and Partnerships: The major objective of the Plant Biology and Tropical Agriculture program is to strengthen the agricultural workforce on Kaua'i and to provide education for technical STEM-related agriculture careers. Current industry feedback indicates difficulty finding local talent with the educational credentials and technical skills needed to fill agriculture positions on Kaua'i. The curriculum relevance relative to employment needs and workforce development is ensured by a program advisory committee. A focus on experiential learning with the option to conduct an internship in collaboration with local employers or organizations provides further opportunities for students to gain experience.

Personal Development: The AS program is targeted towards agriculture professionals for whom educational credentials are a requirement for promotion to a higher position or higher salary. The AS and certificates may also be taken by individuals seeking to enter the agriculture profession. Additionally, certificates may be taken separately or as

concentrations of other degree programs to enhance personal knowledge of agriculture, or more importantly to improve the understanding and basic scientific and agricultural literacy on Kaua‘i.

Table 2.2: Relation between Plant Biology and Tropical Agriculture Program Objectives and UHCC and Kaua‘i CC Mission Statements

UHCC Mission Statement	Kaua‘i CC Mission Statement	Relation to PBT Objectives
<p>Access: To broaden access to postsecondary education in Hawai‘i, regionally, and internationally by providing open-door opportunities for students to enter quality educational programs within their own communities.</p>	<p>Supports students of all ages, cultures, and backgrounds to achieve their educational goals</p>	<ul style="list-style-type: none"> • Program enrollment consists of a diverse student population of different ages, cultures, and backgrounds. • An academic program in PBT will make education in the discipline accessible locally, allowing current agriculture industry employees to remain in their positions while furthering their education. • Many students are unable to relocate from Kaua‘i to pursue education due to personal or professional obligations; a locally available program would overcome these barriers and provide educational access.
<p>Learning and Teaching: To specialize in the effective teaching of remedial/developmental education, general education, and other introductory liberal arts, pre-professional, and selected baccalaureate courses and programs.</p>	<p>Creates curricula and programs responsive to the community’s changing needs for career and work force development</p>	<ul style="list-style-type: none"> • Program curriculum provides relevant science and evidence-based agriculture courses to meet industry and discipline standards and needs and that articulate with baccalaureate agriculture courses. • AS program also provides general education foundation.
<p>Work Force Development: To provide the trained workforce needed in the state, the region, and internationally by offering occupational, technical, and professional courses and programs, which prepare students for immediate employment and career advancement.</p>	<p>Creates curricula and programs responsive to the community’s changing needs for career and work force development</p> <p>Fosters partnerships with schools, the University of Hawai‘i system, and local, state, national, and global communities</p>	<ul style="list-style-type: none"> • Curriculum is designed to foster workforce development and to address local industry concerns regarding the lack of locally available agriculture talent to fill positions. • Curriculum is overseen by industry advisory committee who provide feedback on industry employment needs and curriculum relevance • Program enrollment consists of agriculture industry employees seeking promotion and career advancement, as well as individuals seeking employment in agriculture. • Program focuses on experiential learning and includes an internship that has the option to be conducted in collaboration with local partners.
<p>Personal Development: To provide opportunities for personal enrichment, occupational upgrading, and career mobility through credit and non-credit courses and activities.</p>	<p>Cultivates appreciation for artistic, intellectual, and technical pursuits</p>	<ul style="list-style-type: none"> • AS program provides for career mobility and promotion for current agriculture industry employees for which educational credentials are a requirement for promotion and entry into higher salary positions. • Certificates or individual courses may be taken for personal enrichment or to raise scientific or agricultural literacy.

III. Program Organization Relative to Objectives

The curriculum organization of the proposed AS in Plant Biology and Tropical Agriculture at Kaua'i CC is designed to align with the AS in Plant Biology and Tropical Agriculture program at Leeward CC and with the ASNS concentration in Plant Biology and Tropical Agriculture at Kaua'i CC, which is aligned with 4-year degree programs in agriculture. Kaua'i CC and Leeward CC are the only campuses in the UHCC system to propose an AS degree program in the field of agriculture. Of the other UHCC campuses offering agriculture programs, Maui College and Hawai'i CC both offer Associate of Applied Science (AAS) degrees along with certificate programs, and Windward CC offers a Certificate of Achievement (CA) and other certificate programs.

The AS in Plant Biology and Tropical Agriculture consists of 31-32 credits of concentration courses in horticulture, botany, and plant biology and tropical agriculture, including a required 3 credit experiential learning internship. In addition, general science courses such as one semester of chemistry are also required. Some of the concentration courses also fulfill the general education requirement for Diversification Natural Sciences (DB/DY or DP/DY). The majority of the concentration courses are also included in the curriculum of the AS in Plant Biology and Tropical Agriculture at Leeward Community College, and are designed to articulate with similar courses at 4-year degree programs at UH Mānoa, UH Hilo, or other similar College of Agriculture programs at other institutions.

Kaua'i CC is also offering an Associate of Science in Natural Sciences (ASNS) concentration in Plant Biology and Tropical Agriculture, which is not the subject of the full proposal. The ASNS concentration in Plant Biology and Tropical Agriculture is unique in the UHCC system, and is designed to create a seamless educational pathway for transfer to baccalaureate programs in agriculture. All of the concentration HORT, BOT, or PBT courses are identical between both the AS and ASNS concentration degree, although AS students have the option of taking a lower level soil science course. The major difference between the ASNS concentration and the AS degree pathways involves the chemistry and math requirements. For example, the ASNS program requires the articulated CHEM 161/161L and CHEM 162/162L sequence for a full year of general chemistry, and students in the AS require one semester of either CHEM 161/161L General Chemistry I or CHEM 151/151L Survey of Chemistry. The ASNS concentration also requires MATH 140 Pre-calculus or higher and students in the AS program have the option of taking any FS designated MATH course to fulfill the Foundations: Symbolic Reasoning, FS general education requirement. The close alignment between the ASNS and AS curriculum allow students to change degree program enrollment based on changing educational goals. For example, if an AS Plant

Biology and Tropical Agriculture student decided to transfer to a 4-year degree program, he or she could enroll in the ASNS concentration.

The general education courses for the AS program consist of 18 credits in addition to the Diversification Natural Science requirement already fulfilled under the concentration courses. The general education requirements are based on the ASNS core general education requirements, and are identical between the Plant Biology and Tropical Agriculture ASNS concentration and the AS program, although the ASNS concentration requires additional Writing Intensive and Pacific Cultures graduation requirements. The general education requirements of both degree pathways consist of foundations and diversification courses as standardized across the UHCC system. In addition, students in the ASNS concentration may also take 6 credits of electives, and students in the AS program pathway may take 10 credits of electives. The choice of electives may be customized to fit different individual student needs. For example, students interested in agriculture business ownership or management may take business or accounting courses as electives. In addition, as a commitment to experiential learning, and to encourage students to seek longer multi-semester internship projects or diverse internship experiences with different organizations, students may also earn additional internship credits beyond the minimum program requirement which can be applied to the program credit total as electives. Although the ASNS concentration is optimized for seamless transfer to baccalaureate programs, graduates of the AS program can also transfer all of the courses that are shared between both pathways, but would possibly have to make up the chemistry and math deficiencies after transferring. Primarily, the AS degree is intended to be a terminal degree.

Kaua'i CC is also proposing to offer a 34-35 credit Certificate of Achievement (CA) and a 15 credit Certificate of Completion (CO) under the AS degree program. The certificates may be taken separately by individuals from other degree programs seeking concentrations in the agriculture discipline, or by individuals with degrees in unrelated fields who are interested in changing professions. Certificates may also be earned by individuals not requiring an AS degree for employment, or by individuals seeking knowledge of agriculture for personal interest or life-long learning. The CA shares all of the same concentration courses as the AS but does not include the general education courses and would be well-suited for individuals desiring a foundation in agriculture without having to fulfill the general education requirements. Kaua'i CC also has an existing 22 credit Academic Subject Certificate (ASC), and the curriculum of the ASC and CA are similar; however, the major difference between the ASC and the CA is that the ASC is a concentration under the Liberal Arts, AA degree, whereas the CA is a concentration under the proposed Associate of Science, AS degree. The CO consists of the introductory level concentration courses, and is suited towards individuals seeking a basic understanding of agriculture introductory topics. The certificates can also function as a sequential career

ladder program, whereas students can first earn a CO, then a CA, and finally an AS degree. Detailed information about the Plant Biology and Tropical Agriculture program offerings, curriculum requirements, and courses at Kaua'i Community College is available in Appendix A.

IV. Program Enrollment

Kaua'i CC currently has a 22 credit Academic Subject Certificate (ASC) in Plant Biology and Tropical Agriculture which has been offered since 2012. The current enrollment in the ASC program for the 2013-2014 academic year is 19 students. Enrollment in the ASC consists of individuals employed in the agricultural industry on Kaua'i (63% of enrollment) as well as individuals not currently employed in the agriculture industry but intending to start careers in agriculture (37% of enrollment). Of the students who are current agricultural professionals, their years of experience in the agriculture industry range from a few years to more than 15 years of experience and the majority are employed in the seed industry on Kaua'i.

The AS degree in Plant Biology and Tropical Agriculture is designed to meet the needs of current agriculture professionals as well as individuals looking to start or change careers in agriculture. For current and future agricultural professionals, the Plant Biology and Tropical Agriculture program curriculum provides essential agricultural knowledge and skills needed for job performance. In addition, an AS or BS degree is typically a minimum requirement for salaried research associate positions in the agriculture industry, which carry some management and supervisory responsibilities. Therefore, an AS in Plant Biology and Tropical Agriculture is an important requirement for higher salary, promotion, and career mobility in the agriculture industry. Thus far, many students have enrolled in the Plant Biology and Tropical Agriculture program for the purpose of promotion in their current positions, and it is expected that this demand will increase with the offering of an AS degree.

Currently, agriculture students interested in earning an associate degree have had to either enroll in the Liberal Arts AA degree or in the Associate in Science in Natural Science, ASNS degree with a concentration in biology or physical sciences. An AS degree in Plant Biology and Tropical Agriculture would allow students to complete an associate's degree in their specialized discipline, and would better meet stakeholder and current and future agriculture employee's needs. The projected enrollment increase in table 4.1 is a reflection of the improved relevance in meeting employer and employee needs with an AS degree in Plant Biology and Tropical Agriculture.

Table 4.1: Projected Enrollment in AS Plant Biology and Tropical Agriculture

Projected Enrollment	Academic Year
20	2014-2015
40	2015-2016
40	2016-2017

The target audience of the AS in Plant Biology and Tropical Agriculture consists of current agriculture industry employees, as well as recent high school graduates, and individuals looking to re-enter the work force or change careers. Having an AS program available locally on Kaua‘i is particularly important for this target audience as relocating to another island for educational pursuits may be unachievable due to professional or personal circumstances. For example with an AS in Plant Biology and Tropical Agriculture at Kaua‘i CC, current agricultural professionals can remain in their current employment position while furthering their education. The Plant Biology and Tropical Agriculture program is also structured to accommodate working professionals, with courses being offered during the evenings, including the general education courses which are offered during different times or online. The Plant Biology and Tropical Agriculture program also provides a range of educational opportunities to meet different student needs, including multiple certificates, and a transfer-track ASNS concentration which allows students to complete the first two years on Kaua‘i avoiding the bypass of Kaua‘i CC by students intending to transfer and continue to a BS degree program. Many of the individual Plant Biology and Tropical Agriculture courses can also be taken by non-majors of the program, which will function to address the critical need to increase “agricultural literacy” and understanding of agriculture on Kaua‘i.

Table 4.2 provides additional information regarding student demographics of Kaua‘i CC and enrollment in existing Plant Biology and Tropical Agriculture courses. Students in the Plant Biology and Tropical Agriculture program have a higher average student age compared to the Kaua‘i CC average, and also a higher percentage of males. The Plant Biology and Tropical Agriculture program also enrolls a high percentage of students from underrepresented groups including Native Hawaiians. Therefore the proposed AS degree program in Plant Biology and Tropical Agriculture will result in providing educational access and awarding AS degrees to diverse and underrepresented groups on Kaua‘i.

Table 4.2: Student Demographic Data for Plant Biology and Tropical Agriculture

	Kaua'i CC Average	PBT Course Average
Average Student Age	26.8	35.0
Gender (%)		
Female	60%	31%
Male	40%	69%
Ethnicity (%)		
Native Hawaiian/ Part-Native Hawaiian	31%	31%
Caucasian	23%	19%
Japanese	4%	15%
Filipino	18%	8%
Hispanic	1%	8%
Chinese	0.4%	4%
American Indian or Alaska Native	0.4%	4%
Two or more ethnicities	15%	4%

Source: Kaua'i CC Institutional Researcher

V. Resource Requirements for Implementation and First Cycle of Operation

Kaua'i CC currently has a number of existing resources for the Plant Biology and Tropical Agriculture program and existing resources will be utilized for the new AS Plant Biology and Tropical Agriculture program, minimizing additional resource requirements needed for first cycle of operation. For example, funding from two U.S. Dept. of Labor and Trade Adjustment Act Community College Career and Training (TAACCT) grants have recently been leveraged purchase supplies and equipment for the program and to renovate a new classroom and laboratory space on the Kaua'i CC campus farm which will be utilized for Plant Biology and Tropical Agriculture courses in addition to already existing field plots and a shared shade house area. Detailed information regarding the resource requirements for program implementation and the first three years of program operation are included in the cost and revenue table and detailed below in Table 5.1.

Enrollment (A) and Annual SSH (B): Headcount enrollment was estimated based on current 2013-2014 enrollment of 19 students in the existing 23 credit ASC in Plant Biology and Tropical Agriculture program. The Enrollment and Annual SSH for the first year of operation are based on an estimate of 20 students taking an average of 15 credits per semester. Estimates for years two and three are based on an estimate of 20 students in year two with an additional incoming class of 20 students.

Instructional Cost without Fringe (C): Kaua'i CC currently has one FTE BOR faculty member for the Plant Biology and Tropical Agriculture program, and an additional limited -

term grant-supported faculty member with salary support provided by the Dept. of Labor Trade Adjustment Act Community College Career and Training Grant (TAACCT). In order to support the expansion and development of an AS program and ASNS concentration in Plant Biology and Tropical Agriculture, a second FTE BOR faculty member for the program is requested, and indicated in the cost and revenue table with two FTE BOR faculty members for the program. The instructional cost without fringe is based upon average yearly salary of Science and Math instructors multiplied by the FTE with applied UHPA collective bargaining increases of 3% per year. A no cost extension of the TAACCT grant is currently pending, and if approved, would cover the excess salary expense for year one.

Other Personnel Costs (D): Kaua'i CC does not project any other personnel costs.

Unique Program Costs (E): Kaua'i CC currently has many existing physical resources for the Plant Biology and Tropical Agriculture program, and will not require additional investment for program implementation or operation. Additional instructional supply costs are calculated based on estimated supply costs multiplied by annual program SSH.

Tuition Revenue (G): Proposed tuition rates per credit hour were taken from the 2012-2013 through 2016-2017 Tuition Schedule for UHCCs and the projected annual revenues were calculated by multiplying the tuition rates per credit hour by the annual SSH per academic year.

Instructional Cost with Fringe (K1): The costs are based on the average yearly salary of two Science and Math faculty multiplied by the FTE and applying UHPA collective bargaining increases of 4% per year for inflation. Fringe is calculated at 35% per year.

Support Cost per SSH (L) and Total Campus Expenditure/SSH (N): were taken from the most recent UH Expenditure Study from fiscal year 2011-2012 (<http://www.Hawaii.edu/cgi-bin/iro/maps?esuhfy1112.pdf>).

The comparable Cost/SSH (O): is based on UH Maui College's Agriculture and Natural Resources program from the 2013 UH Annual Report of Program Data (ARPD) (<http://www.hawaii.edu/offices/cc/arpd/instructional.php?action=quantitativeindicators&college=MAU&year=2013&program=118>). The comparison reflects a similar cost of both programs in year one, with lower cost/SSH at Kaua'i CC in years two and three.

Figure 5.1: Kaua'i CC Cost and Revenue Template, Plant Biology and Tropical Agriculture

	A	B	C	D	E	F	G	H	I
1	Academic Cost and Revenue Template - New Program (adjust template for appropriate number of years) (Updated 10/31/12)								
2									
3	ENTER VALUES IN YELLOW CELLS ONLY								
4	CAMPUS/Program			Kauai CC/ A.S. Plant Biology and					
5	Provisional Years (2 yrs for Certificate, 3 yrs for Associate Degree, 6 yrs for Bachelor's Degree, 3 yrs for Masters Degree, 5 yrs for Doctoral Degree)								
6				Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
7	ENTER ACADEMIC YEAR (i.e., 2011-2012)			2014-2015	2015-2016	2016-2017			
8	Students & SSH								
9	A. Headcount enrollment (Fall)			20	40	40			
10	B. Annual SSH			600	1,200	1,200			
11									
12	Direct and Incremental Program Costs Without Fringe								
13	C. Instructional Cost without Fringe			\$ 130,000	\$ 133,900	\$ 137,916			
14	C1. Number (FTE) of FT Faculty/Lecturers			2.00	2.00	2.00			
15	C2. Number (FTE) of PT Lecturers			-	-	-			
16	D. Other Personnel Costs			\$ -	\$ -	\$ -			
17	E. Unique Program Costs			\$ 2,000	\$ 4,000	\$ 4,000			
18	F. Total Direct and Incremental Costs			\$ 132,000	\$ 137,900	\$ 141,916			
19									
20	Revenue								
21	G. Tuition			\$ 68,400	\$ 146,400	\$ 156,000			
22	Tuition rate per credit			\$ 114	\$ 122	\$ 130			
23	H. Other			\$ -	\$ -	\$ -			
24	I. Total Revenue			\$ 68,400	\$ 146,400	\$ 156,000			
25									
26	J. Net Cost (Revenue)			63,600	-8,500	-14,084			
27									
28									
29									
30	Program Cost per SSH With Fringe								
31	K. Instructional Cost with Fringe/SSH			\$ 293	\$ 151	\$ 155			
32	K1. Total Salary FT Faculty/Lecturers			\$ 130,000	\$ 133,900	\$ 137,916			
33	K2. Cost Including Fringe of K1			\$ 175,500	\$ 180,765	\$ 186,187			
34	K3. Total Salary PT Lecturers			\$ -	\$ -	\$ -			
35	K4. Cost Including fringe of K3			\$ -	\$ -	\$ -			
36	L. Support Cost/SSH			\$ 402	\$ 402	\$ 402			
37	Non-Instructional Exp/SSH			\$ 339	\$ 339	\$ 339			
38	System-wide Support/SSH			\$ 63	\$ 63	\$ 63			
39	Organized Research/SSH			\$ -	\$ -	\$ -			
40	M. Total Program Cost/SSH			\$ 695	\$ 553	\$ 557			
41	N. Total Campus Expenditure/SSH			\$ 686	\$ 686	\$ 686			
42									
43	Instruction Cost with Fringe per SSH								
44	K. Instructional Cost/SSH			\$ 293	\$ 151	\$ 155			
45	O. Comparable Cost/SSH			\$ 276	\$ 276	\$ 276			
46	Program used for comparison.			Maui College Agriculture and Natural Resources					
47									
48	Reviewed by campus VC for Administrative Affairs:								
49									

VI. Program Efficiency

The AS program in Plant Biology and Tropical Agriculture will expand and build upon the currently existing certificate program in Plant Biology and Tropical Agriculture. The proposed AS program will efficiently utilize existing faculty and physical resources of the Plant Biology and Tropical Agriculture program. Federal grants such as the U.S. Dept. of Labor Trade Adjustment Act Community College Career and Training grant (TAACCCT) have been leveraged to purchase supplies and equipment and for building renovations which will be utilized by the new program. The AS program also relies upon other required science and general education courses at Kaua'i CC, which are taught by other well-qualified faculty members. Faculty from the Plant Biology and Tropical Agriculture program also intend to seek diversification designation for individual courses, thus increasing enrollment by non-majors fulfilling science general education requirements, and also functioning to increase "agricultural literacy" among non-agricultural students and professionals.

The program efficiency will also be further strengthened through joint-campus initiatives and curriculum consistency between Kaua'i CC and Leeward CC, and other UH campuses. In addition, the Plant Biology and Tropical Agriculture program at Kaua'i CC will also develop collaborative partnerships with local employers for the purpose of involving students in internships or collaborative research projects to further student education through experiential learning.

VII. Program Effectiveness

The program effectiveness will be measured using student achievement data, assessment of program and student learning outcomes, and the Annual Program Review Update (APRU) process to measure program health. Factors such as declared majors, degree or certificate completion rates, and transfer rates to baccalaureate programs, and the number of transfers who successfully complete four-year degrees will also be used to assess program effectiveness. Additional methods to further evaluate career placement or promotion of program graduates will also be explored. Both the assessment and APRU processes at Kaua'i CC are evaluated annually.

The Plant Biology and Tropical Agriculture program at Kaua'i CC also utilizes an Agriculture Advisory Committee made up of local agricultural experts and stakeholders. The Advisory Committee provides relevant feedback on industry employment needs, and also evaluates the relevance of the Plant Biology and Tropical Agriculture courses and

program curriculum. The Advisory Committee performs a vital function in ensuring program effectiveness relative to workforce development needs.

VIII. References

- Lan F. (2012) Characteristics of Recent Science and Engineering Graduates: 2008, Detailed Statistical Tables NSF 12-328, National Science Foundation, National Center for Science and Engineering Statistics, Alexandria, VA.
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- Mooney G.M., Foley D.J. (2011) Community Colleges: Playing an Important Role in the Education of Science, Engineering, and Health Graduates, InfoBrief NSF 11-317, National Science Foundation, National Center for Science and Engineering Statistics, Alexandria, VA.
- National Research Council S. (1988) Understanding Agriculture : New Directions for Education, National Academies Press, Washington, DC, USA.

IX. Appendices

A. Appendix A: Plant Biology and Tropical Agriculture Curriculum

A.1: Kaua'i CC Recommended Curriculum Sequences for Plant Biology and Tropical Agriculture Degree and Certificates:

Table A1: Curriculum Sequence for AS Plant Biology and Tropical Agriculture

Semester 1: Fall	
Course	Credits
BOT 101/101L – General Botany <u>or</u> BIOL 171/171L Introduction to Biology I	4
CHEM 151/151L – Survey of Chemistry <u>or</u> CHEM 161/161L – General Chemistry I	4
PBT 100 - Introduction to Hawai'i Agriculture Industry	1
FS	3
FW	3
Semester Credit Sub-Total	15
Semester 2: Spring	
Course	Credits
HORT 200 – Introduction to Horticulture	3
BOT 130/ 130L – Plants in the Hawaiian Environment	4
FG (A/B/C)	3
DA/DL/DH <u>or</u> DS	3
Elective	2-3
Semester Credit Sub-Total	15-16
Semester 3: Fall	
Course	Credits
PBT 264 - Plant Propagation	3
PBT 275 – Introduction to Crop Improvement	3
FG (A/B/C)	3
DA/DL/DH <u>or</u> DS	3
Elective	3
Semester Credit Sub-Total	15
Semester 4: Spring	
Course	Credits
PBT 141 – Pest Management	3
PBT 204 – Fundamentals of Tropical Soil Science <u>or</u> PBT 122 – Soil Technology	3-4
PBT 290V – Plant Biology and Tropical Agriculture Internship	3
Elective	5-6
Semester Credit Sub-Total	15-16
Credit Total for AS	60

Table A2: Curriculum Sequence for CA Plant Biology and Tropical Agriculture

Semester 1: Fall	
Course	Credits
BOT 101/101L – General Botany <u>or</u> BIOL 171/171L Introduction to Biology I	4
CHEM 151/151L – Survey of Chemistry <u>or</u> CHEM 161/161L – General Chemistry I	4
PBT 100 - Introduction to Hawai'i Agriculture Industry	1
MATH 115 or other FS MATH course	3
Semester Credit Sub-Total	12
Semester 2: Spring	
Course	Credits
HORT 200 – Introduction to Horticulture	3
BOT 130/ 130L – Plants in the Hawaiian Environment	4
PBT 204 - Fundamentals of Tropical Soil Science <u>or</u> PBT 122 Soil Technology	3-4
PBT 141 – Integrated Pest Management	3
Semester Credit Sub-Total	13-14
Semester 3: Fall	
Course	Credits
PBT 264 - Plant Propagation	3
PBT 275 – Introduction to Crop Improvement	3
PBT 290V – Plant Biology and Tropical Agriculture Internship	3
Semester Credit Sub-Total	9
Credit Total for CA	
34	

Table A3: Curriculum Sequence for CO Plant Biology and Tropical Agriculture

Semester 1: Fall	
Course	Credits
BOT 101/101L – General Botany <u>or</u> BIOL 171/171L Introduction to Biology I	4
PBT 100 - Introduction to Hawai'i Agriculture Industry	1
PBT 264 - Plant Propagation	3
Semester Credit Sub-Total	8
Semester 2: Spring	
Course	Credits
HORT 200 – Introduction to Horticulture	3
BOT 130/ 130L – Plants in the Hawaiian Environment	4
Semester Credit Sub-Total	7
Credit Total for CO	
15	

A.2: Kaua'i CC Plant Biology and Tropical Agriculture Program Degree and Certificate Requirements

Table A4: Requirements for AS, CA, and CO in Plant Biology and Tropical Agriculture

Required Courses	AS Plant Biology and Tropical Agriculture	CA Plant Biology and Tropical Agriculture	CO Plant Biology and Tropical Agriculture
<u>Plant Biology and Tropical Agriculture Concentration Courses</u>			
BOT 101 or BIOL 171/171L (General Botany or Introduction to Biology I) (Diversification Natural Sciences, DB/DY) ^{1,3}	4	4	4
HORT 200 (Introduction to Horticulture)	3	3	3
PBT 264 (Plant Propagation)	3	3	3
PBT 141 (Integrated Pest Management)	3	3	--
PBT 275 (Introduction to Crop Improvement)	3	3	--
PBT 290V ² (Plant Biology and Tropical Agriculture Internship)	3	3	--
PBT 100 (Introduction to Hawai'i Agriculture Industry)	1	1	1
BOT 130/ 130L (Plants in the Hawaiian Environment)	4	4	4
PBT 204 (Fundamentals of Tropical Soil Science) or PBT 122 (Soil Technology)	3-4	3-4	--
CHEM 151/151L or CHEM 161/161L (Diversification Natural Sciences, DP/DY) ³	4	4	--
<u>General Education Courses</u>			
Foundation FW Communication: ENG 100 or any FW designated course	3	--	--
Foundation FS Symbolic Reasoning: MATH 115 (Statistics) or any FS designated MATH course	3	3	--
Foundation FG (6) Two courses from different time periods (FGA, FGB, or FCC)	6	--	--
Diversification Literature, Arts, or Humanities: Any DA, DL, or DH designated course	3	--	--
Diversification Social Science: BOT 105 (Ethnobotany) or any DS designated course	3	--	--
<u>Graduation Requirements</u>			
Electives – Any course numbered 100 or higher beyond the specified program requirements applied to credit total ⁴	10-11	--	--
Credit Total	60	34	15

Notes:

¹ – BOT 101 is recommended, but students may substitute BIOL 171/ 171L in place of BOT 101. Students intending to transfer to a baccalaureate program should consult their intended baccalaureate program requirements for recommendations.

² – PBT 290V reflects the minimum number of credits required for graduation as a cumulative total that may be summed over multiple semesters. Excess credits beyond the minimum may be applied as elective credits.

³ – Some courses fulfill both concentration requirements and the general education requirements for Foundations Symbolic Reasoning, FS, and Diversification Natural Sciences (DB/DY or DP/DY).

⁴ – Electives consist of any transfer-level courses beyond the specified degree requirements that can be applied towards the minimum 60 credits needed for graduation. Examples include pre-requisites for required courses, excess internship credits, or courses of relevance or personal interest.

A.3: Course Descriptions for Plant Biology and Tropical Agriculture Courses:

PBT 100 – Introduction to Hawai'i Agriculture Industry Seminar (1)

This course includes an independent reading and research; preparation of abstracts, outlines, and resumes; and oral presentation of information on agriculture-related topics.

BOT 101 – General Botany (4)

This course covers the structure, growth, functions, and evolution of plants and their relationship to the environment and human activities. The course will give the student an overall view of the plant kingdom and the integral part that they play in life. The lecture and laboratory are combined in BOT 101.

PBT 122 – Soil Technology (3)

This course is an introduction to the physical, chemical, and biological properties of soil. This course covers principles of soil formation, composition, texture, organic matter, soil water, pH, plant nutrients, amendment and fertilizers, and soil management.

BOT 130/ BOT 130L – Plants in the Hawaiian Environment (4)

Introduction to the biological sciences demonstrated through the study of the evolution of plant species and communities of the Hawaiian Islands. The course will include the study of ecological interactions, human impact on the environment, observational skills and scientific inquiry, plant structure and form in relation to function, and the identification and systematics of native and introduced flora. BOT 130L is a one-credit laboratory science course designated to accompany BOT 130. The course is a hands-on, experiential approach to the biological sciences. This course will involve students in specific application of lecture materials and concepts through scientific inquiry and field observations. Field trips are included.

PBT 141 – Integrated Pest Management (3)

This course includes an introduction to the principles involved in the control of plant pests including diseases, insects, mites, nematodes, and weeds. Various methods of controlling pests, including the correct method of selecting and applying pesticides will be covered. A presentation on one example of Integrated Pest Management will be required.

HORT 200 – Introduction to Horticulture (3)

This course is an introduction to horticultural crop science with emphasis on plant structure and function, and environmental factors that affect plant growth. The class will cover the horticultural industry, horticultural crop families, growing systems, soil preparation and fertility, soil and water management, plant breeding and varieties, identifying and controlling pests, regulating plant growth, harvesting, value-added applications, and marketing

PBT 204 – Fundamentals of Tropical Soil Science (4)

This course covers the origin, development, properties, classification, use, and management of soils with emphasis on applications in the tropics. The lecture and laboratory are combined.

PBT 264 – Plant Propagation (3)

This is an introductory course in the principles and practices of plant propagation. Studies include seed and vegetative propagation of fruit, vegetable, and ornamental crops. Methods of propagation include: seed, cutting, grafting, air layering, and division.

PBT 275 – Introduction to Crop Improvement (3)

This course includes fundamentals of genetic theory using biotechnological procedures in insect and plant pathogen control and plant and animal breeding as practical applications.

PBT 290V – Plant Biology and Tropical Agriculture Internship (1-3)

The course provides credit for supervised experiential learning projects including independent research projects with an instructor and internships with an employer. The nature of the internship or research project is variable but will be designed to provide an opportunity for experiential learning. Students may enroll in 1-3 credits of PBT 290V per semester, depending on project time commitment.

A.4: Additional Plant Biology and Tropical Agriculture Curriculum Offerings at Kaua'i CC

Academic Subject Certificate (ASC) in Plant Biology and Tropical Agriculture:

Kaua'i CC has offered a 22 credit ASC in Plant Biology and Tropical Agriculture since 2012. The ASC is organized under the Liberal Arts (AA) degree. Students intending to earn an AA degree as opposed to an AS may take the ASC as a concentration in connection with the AA degree.

Table A.5: Program Requirements for ASC in Plant Biology and Tropical Agriculture

Required Courses	ASC Plant Biology and Tropical Agriculture
BOT 101 –(General Botany) or SCI 121/ 121L (Introduction to Science: Biological Science)	4
HORT 200 – (Introduction to Horticulture)	3
PBT 264 – (Plant Propagation)	3
PBT 141 – (Pest Management)	3
PBT 275 – (Introduction to Crop Improvement)	3
PBT 290 –(Plant Biology and Tropical Agriculture (PBT) Internship)	2-3
PBT 100 – (Introduction to the Hawai'i Agriculture Industry)	1
CHEM 151/151L or CHEM 161/161L - (Survey of Chemistry or General Chemistry I)	4
Credit Total for ASC	22

Associate of Science in Natural Science (ASNS) Concentration in Plant Biology and Tropical Agriculture:

Kaua'i CC is also offering an ASNS Concentration in Plant Biology and Tropical Agriculture which is not the subject of the current program proposal. The ASNS concentration is aligned with the first two years of curriculum for College of Agriculture 4-year degree programs at UH Mānoa and UH Hilo and at other College of Agriculture programs at other institutions. The ASNS program is directed towards students intending to transfer into a BS program, and is designed to fulfill program requirements of a typical 4-year agriculture program thereby promoting a seamless educational pathway and transition to a BS program. The ASNS concentration at Kaua'i CC is the only transfer-oriented Agriculture program in the UHCC system.

The general curriculum of the ASNS concentration and the AS in Plant Biology and Tropical Agriculture are identical in the general education requirements, and the majority of the Plant Biology and Tropical Agriculture concentration courses. Individual course articulation agreements would apply for course transfer regardless of whether the course is taken as a requirement for the ASNS or the AS program. The major difference between the ASNS concentration and the AS curriculum is that the ASNS concentration includes additional requirements in chemistry and math to meet baccalaureate program requirements. For example, ASNS concentration students are required to take both CHEM 161/161L and CHEM 162/162L, the general chemistry course sequence which is articulated throughout the UH system; whereas AS students may take CHEM 151/151L, Survey of Chemistry, which is not accepted for transfer as a baccalaureate program requirement. In addition, MATH 140 Pre-calculus, which is a minimum math requirement for most agriculture baccalaureate programs, is a requirement for the ASNS program; whereas any FS designated course can be taken to satisfy the AS program math requirement. Graduates of the AS program can still transfer most of their courses to an agriculture baccalaureate program, but would possibly have to make up deficiencies in chemistry and math after transferring.

Table A6: Program Requirements for ASNS Concentration in Plant Biology and Tropical Agriculture

Required Courses	ASNS Plant Biology and Tropical Agriculture
Plant Biology and Tropical Agriculture Concentration Courses	
BOT 101 (General Botany) or BIOL 171/171L (Introduction to Biology I) (Diversification Natural Sciences, DB/DY) ^{1,3}	4
HORT 200 (Introduction to Horticulture)	3
PBT 264 (Plant Propagation)	3
PBT 141 (Integrated Pest Management)	3
PBT 275 (Introduction to Crop Improvement)	3
PBT 290V ² (Plant Biology and Tropical Agriculture (PBT) Internship)	3
PBT 100 (Introduction to Hawai'i's Agriculture Industry)	1
BOT 130/ 130L (Plants in the Hawaiian Environment)	4
PBT 204 (Fundamentals of Tropical Soil Science)	4
CHEM 161/161L (General Chemistry I) (Diversification Natural Sciences, DP, DY) ³	4
CHEM 162/162L (General Chemistry II) (Diversification Natural Sciences, DP, DY) ³	4
MATH 140 (Pre-calculus) or higher (Foundation Symbolic Reasoning, FS) ³	3
General Education Courses	
Foundation FW Communication: ENG 100 or any FW designated course	3
Foundation FG (6) two courses from different time periods (FGA, FGB, or FCC)	6
Diversification Literature, Arts, or Humanities: any DA, DL, or DH designated course	3
Diversification Social Science: BOT 105 Ethnobotany or any DS designated course	3
Graduation Requirements	
Writing Intensive, WI – Any WI designated course ³	
Pacific Cultures, PC – BOT 105 Ethnobotany or any PC designated course ³	
Electives – Any course numbered 100 or higher beyond the specified program requirements applied to credit total ⁴	6
Credit Total for ASNS Concentration	60

Notes:

¹ – BOT 101 is recommended, but students may substitute BIOL 171/ 171L in place of BOT 101. ASNS concentration students should consult their intended baccalaureate program requirements for recommendations.

² – PBT 290V reflects the minimum number of credits required for graduation as a cumulative total that may be summed over multiple semesters. Excess credits beyond the minimum may be applied as elective credits.

³ – Some courses fulfill both concentration requirements and the general education requirements for Foundations Symbolic Reasoning, FS, and Diversification Natural Sciences (DB/DY or DP/DY). Students are also encouraged to satisfy the WI and PC graduation requirement by “double-dipping” with foundations or diversification courses with WI and PC designation.

⁴ – Electives consist of any transfer-level courses beyond the specified degree requirements that can be applied towards the minimum 60 credits needed for graduation. Examples include baccalaureate program general education requirements, pre-requisites for required courses, excess internship credits, or courses of relevance or personal interest. More than the minimum 60 credits may occur if WI and PC graduation requirements are not fulfilled with other general education courses, or if additional course pre-requisites are needed.

B. Appendix B: Letters of Support



The Chemical Company

Helping Make
Products Better™

June 18, 2013

Dr. James Dire
Kauai Community College
3-1901 Kaunuaillii Highway
Lihue, HI 96766

Dear Dr. Dire,

I would like to convey my strong support for developing an Associate level degree program in Agriculture at Kauai Community College. As a member of the seed industry on Kauai we are in need of employees with agricultural skills. My experience over the last 8 years is that workforce skills in agriculture are very limited.

There is a ready market on Kauai for agricultural skills in the seed industry which pays above average wages and provides good benefits to employees. There currently is not a clear post-secondary educational path for young people interested in agriculture.

The ability for a local student to obtain an AA before moving on to a four year BS program would also be very beneficial in providing the next level of skills needed by the seed industry.

An Associate degree in Agriculture has many benefits to the community and I would strongly support any effort to establish that program.

Sincerely

Steven J. Lupkes
Research Station Manager

-

BASF Plant Science, L.P.
7189-D Kaunuaillii Highway
P.O. Box 127
Kekaha, Hawaii 96752
Tel: (808) 337-2065
Fax: (808) 337-2067



Dow AgroSciences



Dow AgroSciences LLC

P.O. Box 450, Kaunakani, HI 96747 USA Tel 808-335-8350 Fax 808-335-8301

dowagro.com

March 5, 2014

James Dire
Vice-Chancellor of Academic Affairs
Kauai Community College
3-1901 Kaunualii Hwy
Lihue, HI 96766

Dear Dr. Dire,

As the Site Leader for Dow Agro Sciences Kauai, may I share with you today, my strong support for the development of an **Associate of Science degree program in Plant Biology and Tropical Agriculture** at Kauai Community College.

A program initiated at the College will provide a catalyst for students to pursue a career in this field and fill a void we presently have for experienced people. There is a market on Kauai for agriculture skills in the seed industry which pays above average wages and provides good benefits to employees. At this time, unfortunately, we are looking "out of state" for this caliber of employee who can perform the necessary tasks. My team and I would love nothing better to offer "jobs to our local community" and have students intern at our campus for credits, or job training opportunities.

Agriculture is a leading industry in Hawaii's history. Sustainability in this field is key to our physical existence on island and helping produce "Kauai Grown food and products" for the world. The ability to offer students opportunity in obtaining a degree, and then move into the next level of a four year Bachelor of Science degree (hopefully at the University of Hawaii Manoa campus) is the future for Kauai.

Simply – it is DOW's culture to "Cultivate Scientists" in order to keep pace with the growing needs of our world's rapidly expanding population. We are honored to be asked to participate in "planting the seed" of opportunity for the future graduates of his curriculum. Anything we can do to assist you, please feel free to contact me personally.

Your kind consideration in the creation of this program at our College is appreciated.

Sincerely,

Peter Wiederoder
Site Leader



DuPont Agriculture & Nutrition
Crop Genetics Research & Development
Waimea Research Center
1-385 Kaunualii Highway
P.O. Box 609
Waimea, HI 96796

March 3, 2014

Dr. James Dire
Kauai Community College
3-1901 Kaunualii Highway
Lihue, HI 96766

Dear Dr. Dire,

I am writing to you in support of developing an associate-level agriculture degree program at Kauai Community College. Kauai is a great community, however career and schooling options are somewhat limited. As a result I've witnessed many talented local residents leave the island to pursue opportunities elsewhere.

For some of these local residents an associate program in agriculture could open a great career path right here on the island. I have been a manager at DuPont Pioneer's Waimea Research Center for nearly 10 years. We are continually looking for talented local staff and fully support employees as they pursue further education.

There is a large demand for agricultural skills here on the island. Both the seed businesses and emerging local agriculture initiatives offer excellent opportunities. Many of my staff have already benefited from additional training at KCC. Local businesses and companies such as ours could continue to partner together with KCC to educate employees and provide future students of Kauai a great path forward. It is my sincere hope that KCC will be able to provide an associate degree in the field of agriculture

Respectfully,

Josh Hager
Research Scientist
DuPont Pioneer – Waimea Research Center



Pioneer Hi-Bred International, Inc.
U.S. Region
Waimea Research Center
1-385 Kaunualii Hwy
P.O. Box 609
Waimea, HI 96796

Ryan K. Oyama, Ph.D.

mobile: +1-808-346-5329
fax: +1-808-338-8325

Dr. James Dire
Kaua'i Community College
3-1901 Kaunualii Highway
Lihue, HI 96766

2014.03.24

Associate Degree Program in Agriculture

Dear Dr. Dire,

I am writing to express my support for an Associate level degree program in Agriculture at Kaua'i Community College. This program would help to fulfill a need on this island for education and training in an important segment of our economy. Graduates of this proposed program would have increased opportunities to pursue or enhance their career at home on Kaua'i.

Currently, potential students interested in pursuing a career in agriculture are faced with barriers to obtain the qualifications and training required for success. Many of the agricultural jobs on Kaua'i are in research and the development of new crops. These are science based activities that require employees with the requisite knowledge and experience. To obtain these qualifications, students must either move off island or enroll in an online program, which will deny them the hands-on experience through which science is best learned. The proposed degree program would eliminate these barriers-to-entry for Kaua'i residents.

In addition, a degree program would likely attract more candidates to pursue education and training in agriculture. The opportunity to earn a degree (as opposed to a certificate) will make the time, effort, and expense more worthwhile. It will also make it easier for those already working in agriculture to improve their skills. For example, DuPont Pioneer reimburses employees for tuition paid for a degree program. An Associate degree would also make it easier for graduates to continue their education to obtain higher degrees (e.g. Bachelor's) should they decide to do so.

Sincerely,

A handwritten signature in blue ink, appearing to read "Ryan K. Oyama".

Ryan K. Oyama, Ph.D.



P.O. Box 879
Waimea, HI 96796

Dear Chancellor Cox,

I would like to extend my strong support for an Associate of Science (AS) degree program in Plant Biology and Tropical Agriculture at Kauai Community College. As a member of the seed industry on Kauai, Syngenta Hawai'i needs skilled employees with the tools and training that prepare them for success in agriculture.

Syngenta believes in providing jobs with livable wages, good employee benefits, and opportunities for growth. Building an experienced, trained workforce on Kaua'i would also greatly enable our ability to hire locally. Additionally, the ever increasing focus on diversifying agriculture and building a strong, local agricultural workforce necessitates training programs like this to provide the resources and guidance to attract students to this industry.

It would be valuable for students on Kauai to gain the basic foundations in agriculture through an AS program, which would prepare them for employment or transfer to a four-year agriculture degree program. Advanced training and skills are needed for employees at all levels of positions in the seed industry.

An Associate degree level in agriculture on Kauai would greatly benefit the local agriculture industry and community. Again, I strongly support Kauai Community College's development of this program.

Sincerely,

A handwritten signature in black ink that reads "Steven Kai". The signature is written in a cursive, flowing style.

Steven Kai
Parent Seed Manager



P.O. Box 879
Waimea, HI 96796

Letter of Support

Aloha,

My name is Mark Phillipson and I represent Syngenta Hawaii. We are seed farmers in Hawaii that produce valuable corn and soybean seed for farmers' primarily in North America and throughout the world.

Our industry today represents 2,000 agricultural jobs that pay one third more than other agricultural endeavors in the state. The industry contributes over \$550 million to the state's economy and pays over \$30 million in state taxes.

We are in constant need of good local talented young men and women who can live and stay in Hawaii. We need the training that Kauai Community College can provide, in particular academic programs in Plant Biology and Tropical Agriculture.

Students from these programs can have a good paying job in the industry of their choice and not have to move to the mainland.

Thanks for your continued support of these programs.

Sincerely,


Mark Phillipson *For MARK PHILLIPSON*

Syngenta Hawaii, LLC



4110 Waha Road
Kalaheo, HI 96741
June 14, 2013

Re: Support letter for an Associate in Science (A.S.) degree in Plant Biology and Tropical Agriculture along with a Certificate of Achievement (C.A.), and a Certificate of Completion (C.C.)

To Whom It May Concern:

I am writing to convey my strong support for the development of an A.S. degree in Plant Biology and Tropical Agriculture along with the C.A., and C.C. certificates at Kauai Community College, and Leeward Community College. I am a farmer and a retired UH faculty. I received a Ph.D. in Physiology from Oregon State University and did post-doctoral research at University of Texas Medical Branch and SRI International. Additional degrees and coursework in electronics, data processing, and business administration and work at high tech companies in Silicon Valley allowed me to develop the Electronics Technology program at Kauai Community College. I also created two apiaries and a honey bee lab at the college and have a working relationship with agriculture faculty in this endeavor. I retired last summer to run the family's diversified agriculture farm but still volunteer at the college to support the satellite tracking operations in electronics and research at the bee lab. I am on the advisory board for Kauai CC agriculture program and will continue to work to develop sustainable agriculture on Kauai.

An agricultural degree and certificate program is extremely important if Hawaii is ever to reduce its dependency on imported food and gain a measure of sustainability. Agricultural science will provide students with the background to choose from a wide array of careers that fall within the scope of Hawaiian agriculture. A community college-based program will provide education and training that addresses the needs of the local agri-businesses much as the electronics program I developed focused on the needs of the local high tech businesses and the Pacific Missile Range Facility.

I strongly encourage the Office of the Board of Regents to grant Kauai Community College and Leeward Community College an Authorization to Plan a collaborative program. A collaborative program avoids unnecessary duplication and makes more efficient use of administrators and faculty. A collaborative effort will allow faculty from both colleges to share information and keep pace with the rapid advances in the broad field of agricultural science and technology. The derived synergy will result in a more realistic and higher quality program that will be able to conduct scientific research and transfer new technology to the community.

I am strongly support about the development of this program and will be happy to participate in its development. This program is one that is well suited to the UH community colleges. Furthermore, as a commercial farmer in Hawaii, I will be happy to provide my farm area to teach new students and interns of both colleges. If I can help in any other way, please don't hesitate to contact me. You can email me at francist@hawaii.edu or call me at 808 369-6409.

Sincerely,

A handwritten signature in cursive script that reads "Francis Takahashi".

Francis Takahashi, PhD



I. Introduction

The Plant Biology and Tropical Agriculture program at Leeward Community College (Leeward CC) proposes to offer a new Associate in Science (AS) degree in Plant Biology and Tropical Agriculture (PBT). The degree is designed to prepare graduates for employment as agricultural or natural resource technicians in diversified agriculture, horticulture and landscape industries. It also offers a transfer pathway to four year colleges, including the College of Tropical Agriculture and Human Resources (CTAHR) at UH Mānoa and UH West O’ahu.

In 2011, United State Department of Agriculture, National Agriculture Statistics Service reported that Hawai’i farm gate revenues increased to \$719.5 million from the revised 2010 level of \$674.6 million ⁽¹⁾. Although farm value is also increasing steadily from 2007-2011, most of Hawai’i’s food is imported. Hawai’i spends more than \$3.1 billion in food of which an estimated 85% is imported. According to Office of Planning, Department of Business, Economic Development & Tourism (DBEDT), replacing just 10% of the food import would be worth \$313 million and generate more than 2,300 jobs ⁽²⁾. Therefore, both government and non-government sections have established various strategies to increase agriculture production, food security and food self-sufficiency. One of the strategy objectives calls for development of a coordinated pathway of agricultural training at elementary, secondary and postsecondary school levels.

Leeward CC, which services the area of O’ahu with the greatest density of agriculture and conservation lands, offers several courses related to Agriculture and Natural Resource Management. However, it does not offer a degree in these fields except two Academic Subject Certificates (ASCs) in related fields. The new AS degree builds on the two ASCs: ASC in Plant Biology and Tropical Agriculture and ASC in Community Food Security.

Recognizing the increasing demand for agriculture and food production, the PBT program will provide comprehensive skill sets in agriculture including hands-on field and laboratory experiences and internships in plant and soil sciences, horticulture, sustainable crop production, crop improvement and agribusiness to meet the workforce needs of the

Agriculture and Natural Resource Management employment sectors. Additionally, it will create jobs and education opportunities for students for the under-served region on the Leeward-Waianae Coast.

The proposed AS in PBT degree is the result of a concerted collaboration within faculty from University of Hawai'i Community Colleges (UHCC) system including Hawai'i CC, Kaua'i CC, , Maui College, Windward CC as well as UH Mānoa and UH West O'ahu. The AS in PBT degree has been supported by agribusinesses, nonprofits and community organizations engaged in agriculture and natural resource management. Letters of support from both academia and business community, reflecting the need for post-secondary levels education for the expansion in agriculture are presented in Appendix A.

The new AS degree aims to fulfill the education needs of the changing agribusiness sector in Hawai'i and it is designed as a terminal degree for highly skilled agricultural technicians while also providing an opportunity to transfer to a four-year program.

II. Program Objectives

The overall objective of the PBT Program is to prepare students for a career in agriculture and natural resource management through hands-on training and classroom instructions. Students will develop the skills and acquire knowledge in plant and soil science, horticulture and micropropagation, crop production and basic business principles. The courses, curriculum and program learning outcomes are designed to promote learning related to workforce and economic development. The program aims to meet both UH system academic goals and the skill sets needed for advancement in agriculture careers.

The PBT program will:

- Train Hawaii's Agriculture and Natural Resource Management Technicians to meet the changing workforce needs of agribusinesses, nonprofits and government sectors.
- Utilize the existing courses, certificates and resources and build stackable credentials (Appendix B) leading to a terminal AS degree while also providing an opportunity to transfer to four-year campuses including UH Mānoa, UH Hilo and UH West O'ahu.
- Build on existing non-credit courses and offer bridge courses between credit and non-credit programs.

- Provide new employment opportunities to Leeward Coast students with a higher skill, higher wage, and higher demand jobs in agribusiness and government sectors.
- Work with other University of Hawai'i campuses to meet the agricultural workforce and the community needs.

Program Learning Outcomes (PLOs):

Upon successful completion of the PBT degree program, graduates will be able to:

- a. Use appropriate scientific and agricultural terminology to communicate in different settings and with different audiences.
- b. Identify and analyze the biotic and abiotic factors that affect agricultural production and manage these factors at the local, state, national, and global level.
- c. Understand and apply principles and practices from plant and soil sciences, and tropical agriculture to improve production and profitability.
- d. Apply scientific methods and information technology to manage agronomic and agribusiness challenges and opportunities.
- e. Demonstrate the fundamental knowledge of the contemporary issues involving food, agriculture and the environment.

III. Relation to College Mission and University Strategic Plan

The Leeward CC Strategic Plan is aligned with the University of Hawai'i Community College (UHCC) System and the University of Hawai'i (UH) System Strategic Plan to establish a focus on critical issues affecting the colleges and the State and to set budget priorities. The AS in PBT degree will address both Leeward CC Mission 2013-2014 and UH Systems 2008 - 2015 Strategic Plan.

A. Leeward CC Mission

At Leeward Community College, we work together to nurture and inspire all students. We help them attain their goals through high-quality liberal arts and career and technical education. We foster students to become responsible global citizens locally, nationally, and internationally. We advance the educational goals of all students with a special commitment to Native Hawaiians.

Community: We value cooperation, collaboration, social responsibility, and concern for others as crucial elements in building a sense of community inside and outside of the institution.

Diversity and respect: We value individual differences and the contributions they bring to the learning process. Students are enriched through a diverse intellectual and social environment, where learning occurs through exposure to world cultures, and through interaction with peoples of diverse experiences, beliefs, and perspectives.

Integrity: We value personal and institutional integrity by fostering a culture of continuous improvement to open pathways to student success. We hold ourselves accountable for providing a high-quality academic experience.

Open access: We value all students. We seek to meet their needs, as well as those of the community, by offering a diversity of courses, degree and certificate programs, and training opportunities, through traditional and distance education modes of delivery.

B. University of Hawai'i System Strategic Plan

The AS in PBT aligns with the University of Hawai'i System Strategic Outcomes and Performance Measures (2008-2015). In particular, it will:

- Support Native Hawaiian Educational Attainment
- Improve Hawai'i's Educational Capital and
- Addresses workforce shortage and prepare globally competitive workforce.

The new AS in PBT Program is proposed for students on the Leeward Coast to be active participants in this program thus reaching low-income students in an underserved region. Furthermore, the AS degree closely aligns with the Achieving the Dream Challenge [<http://www.achievingthedream.org/goal/challenge>]:

For the first time in U.S. history, the current generation of college-age Americans will be less educated than their parents' generation, yet our workplaces require higher -

level skills than ever before. A healthy economy and democracy depend upon an educated citizenry, and increasingly, because of rapidly changing demographics and record levels of poverty, that means creating the conditions for more low-income students and students of color to attain postsecondary credentials.

Community colleges are a vital component in returning the U.S. to its place as a global leader in higher education degree attainment; however, fewer than half of all students who enter community college with the goal of earning a certificate or degree have met their goal six years later. And those numbers are much worse for low-income students and students of color. More than just their hopes and dreams are at stake: the very foundation of our economy depends on increasing student success.

The proposed AS in PBT degree will fulfill the following goals outlined in the Strategic Outcomes & Performance Measures, 2008–2015 (http://www.leeward.hawaii.edu/files/SP_Update_July2011.pdf). The performance measures and corresponding Leeward Strategies (in parentheses) are aligned with the UH and UHCC system goals as summarized below.

GOAL A: Native Hawaiian Educational Attainment and Hawaii’s Educational Capital

Educational Effectiveness and Student Success (UH System)

Promote Learning & Teaching for Student Success (UHCC System)

Position the University of Hawai‘i as one of the world’s foremost indigenous-serving universities by supporting the access and success of Native Hawaiians (A) and increase the educational capital of the state by increasing the participation and completion of students, particularly low-income students and those from underserved regions (B).

- Increase number of educational options that meet the needs of the Native Hawaiian community. (A.A1.c)
- Increase Native Hawaiian student awareness of traditional and non-traditional career opportunities. (A.A4.b)
- Increase number of educational options that meet the needs of the community. (A.B1.c)

GOAL B: Globally Competitive Workforce

A Learning, Research, and Service Network (UH System)

Functions as a Seamless State System (UHCC System)

- Address critical workforce shortages and prepare students for effective engagement and leadership in a global environment.
- Articulate associate degrees with baccalaureate programs in shortage areas at UH and other 4 –year campuses to shorten time to degree. (B.1.b)
- Market and recruit for programs that target occupations in identified shortage areas. (B.1.d)
- Develop and market programs that target the incumbent worker. (B.2.a)
- Identify occupations where there is a demonstrated state of Hawai'i shortage of qualified workers and where the average income is at or above the U.S. average. (B.4.a)
- In consultation with business and industry in the shortage areas, create short-term training programs that will meet employer needs. (B.4.b)

GOAL C: Economic Contribution

A Model Local, Regional, and Global University (UH System)

Promote Workforce and Economic Development (UHCC System)

Contribute to the state's economy and provide a solid return on its investment in higher education through research and training.

- Develop partnerships with business and industry. (C.1.d)

GOAL D: Hawai'i's Educational Capital/Resources and Stewardship

Investment in Faculty, Staff, Students, and Their Environment (UH System)

Develop our Human Resources: Recruitment/ Retention/Renewal (UHCC System)

Recognize and invest in human resources as the key to success and provide them with an inspiring work environment.

- Identify instructional/training programs in underserved regions where there is a workforce need, and can be delivered via distance education. (D.2.a)
- Provide resources to develop or modify student support services that specifically address the needs of the DE student. Develop partnership with high schools and other community organizations to use distance education resources. (D.2.c)

IV. Needs Assessment

The State of Hawai'i Office of Planning, DBEDT, and HDOA published "Increased Food Security and Food Self-Sufficiency Strategy" in October 2012 ⁽²⁾, which emphasized increasing local food production by promoting local food consumption, strengthening agricultural infrastructure i.e. agricultural parks, irrigation systems and distribution systems/facilities. It also recommended actions to provide for food safety, pest prevention and control, workforce training, research and extension services; and policy and organizational support. The improvements of agriculture frameworks have been established by many organizations include:

- The Hawai'i State Constitution is the foundational governing document for the State of Hawai'i. Article XI, Section 3 of the Hawai'i State Constitution supports diversified agriculture in Hawai'i: "The state shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands."
- The Hawai'i State Plan, HRS Chapter 226, is a long-range comprehensive plan that establishes the goals, objectives, priorities, policies, and implementation measures for the long-term development of the State of Hawai'i. 226-7 Objectives and Policies for the economy- agriculture:
 7. Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawai'i's producers and consumer markets locally, on the continental United States, and internationally.
 13. Promote economically competitive activities that increase Hawai'i's agricultural self-sufficiency.
 14. Promote and assist in the establishment of sound financial programs for diversified agriculture.
- The [A New Day in Hawai'i Plan](#) by Governor Abercrombie supports the State's plans for agricultural self-sufficiency and food security by promoting initiatives to:
 - Preserve and start growing on agricultural lands.
 - Repair irrigation systems that are underutilized or structurally unsound.
 - Develop integrated agricultural, environmental, and cultural education programs.

- Lower the cost of farming for community-based entrepreneurs.
 - Raise the supply of local food.
 - Raise the demand for local food.
 - Support individual participation through storm water recapture and community, schools and family gardens
- The Department of Labor and Industrial Relations (DLIR) is implementing the Hawai'i Green Jobs Initiative (HGJI), which include agricultural jobs. DLIR worked with HDOA, Hawai'i Farm Bureau, University of Hawai'i, community colleges and county governments to conduct Sustainable Agriculture Skills panels on O'ahu and in East Hawai'i.
 - A "Strategic Plan for Transforming Agriculture and Natural Resources Education in Hawai'i" was developed with funding from National Science Foundation in 2009. Among others the plan identified a need to improve perception of Agricultural and Natural Resource Careers and suggested ways to improve preparation for the careers, articulation between UH System Campuses and increase effective partnerships between industries and academia (Appendix E). This report and subsequent funding from NSF have served as catalyst to improve and update Agriculture and Natural Resource Management Curricula at Leeward CC and articulation with other campuses.

Discussions with agricultural employers and organizations have identified the need for more skilled labor force with a minimum AS degree level of technical and scientific training. Besides they would like the graduates to be better skilled in critical thinking, communications, business management, teamwork, problem solving, and leadership. However, currently there is a shortage of locally available individuals with technical and scientific training to meet the needs of major agricultural employers. According to the U.S. Bureau of Labor Statistics and State of Department of Labor and Industrial Relations ⁽³⁾⁽⁴⁾, a diverse range of employment opportunities are available for graduates and expected to increase in the future.

Table 1. Employment Projection and Wage Estimates for occupations related to agriculture

Occupational employments	SOC Code	National job projection 2020 ¹	Annual job opening		Growth Projection Honolulu MSA ³	Median wage	
			Nation ¹	Hawai'i ²		Nation ¹	Hawai'i ²
Farmers, Ranchers, and Other Agricultural Managers	11-9013	1,106,400	23,450	110	-4.2%	\$69,300	NA
First-Line Supervisors of Landscaping, Lawn Service, and Grounds keeping Workers	37-1012	233,600	6,010	50	11.7%	\$42,200	\$43,800
Pesticide Handlers, Sprayers, and Applicators, Vegetation	37-3012	32,500	820	0	1.64%	\$30,270	NA
Soil and Plant Scientists	19-1013.00	18,300	860	10	7.9%	\$58,700	NA
Agricultural Technicians	19-4011.01	22,800	870	10	9.2%	\$34,100	\$37,400
Forest and Conservation Technicians	19-4093.00	36,100	1,540	10	7.8%	\$33,900	\$36,500
Precision Agriculture Technicians	19-4099.02	69,400	3,350	30	3.2%	\$43,100	\$50,800
First-Line Supervisors of Farming, Agricultural Crop, Horticultural and Forestry Workers	45-1011.07	46,300	1,360	10	6.9%	\$42,600	\$44,000

¹ National Data Source: Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections; projection period based on year 2010-2020.

² State Data Source: State of Department of Labor and Industrial Relations, Research and Statistics Office, Median wage based on year 2012

³ Long-term projection (2010-2020) Hawaii Workforce Infont: <https://www.hiwi.org/gsipub/index.asp?docid=423>

Besides the above occupations, students can pursue relevant careers such as agricultural and food science technicians, agricultural inspectors; and agricultural Sciences Teachers. Based on the Occupational Information Network (O*NET), many of these occupations are considered 'Bright Outlook', which are expected to grow rapidly in the next several years, and will have large numbers of new job openings and replacements. The job mobility and national median yearly income for community college graduates far exceeds that of workers without any post-secondary education.

The AS in PBT will provide post-secondary levels education, which not only prepare farmers, returning non-traditional students and youth to start various occupations in agriculture successfully, but also lead to more employment opportunities and better pay in the workforce. The PBT Program learning outcomes and courses address the Leeward CC Institutional learning outcomes of critical thinking and problem solving; written, oral communication, and use of technology; and values, citizenship, and community (Appendix C).

V. Curriculum (Associate in Science in Plant Biology and Tropical Agriculture)

The AS in PBT will consist of four semesters of coursework, which is divided into three stackable credentials. During the first year, students can earn two credentials, 14 credits of Certificate of Competence (CO) and 34 credits of Certificate of Achievement (CA). Both certificates focus intensively on agriculture principles and practices. The two certificates are stackable to the AS degree that includes 40 credits of science and agriculture concentration courses, and 24 credits of general education, business management and environmental science courses. All required and elective courses for the AS degree are already included in the Leeward CC curriculum. The curriculum is designed to allow flexibility in selection of general science courses that satisfies the educational and training needs of terminal as well as transfer students. To ensure choice and flexibility, each student will be required to consult with a counselor before s/he registers for the new semester.

Program planning, development of curriculum and courses are presented in (Appendix D). Leeward CC has also consulted with UHCC's, UH Mānoa, and UH West O'ahu and has developed a built-in pathway for students opting to go for a terminal degree or 4-year transfer track.

First Semester (15-18 credits)		
Course Alpha/No.	Course Title	Credits
DS Courses (SOC 151)	Diversification Social Sciences (DS) Introduction to the Sociology of Food (suggested)	3
BOT 130 or HORT 110	Plants in Hawaiian Environment or Hawai'i Horticulture & Nutrition	4
CHEM 151B or CHEM 161B	Elementary Survey Chemistry or CHEM161B General Chemistry or other Diversification Physical (DP+DY)	4
PBT 100	Orientation to Hawai'i's Agriculture Industry	1
PBT 122	Introduction to Soils	3
PBT Electives*	PBT Electives	3

Second Semester (Certificate of Achievement) (16 credits)		
Course Alpha/No.	Course Title	Credits
FG course (HIST 151)	Foundation Global Multicultural Perspectives (FG) World History I (suggested)	3
DA/DH/DL course (HWST 107)	Diversification Arts, Humanities, and Literature (DA/DH/DL) Hawai'i: Center of the Pacific (DH) (suggested)	3
MATH 100 or MATH 103 or higher FS	Survey Math or College Algebra or any higher FS designated course	3
AG 112 or PBT 200 +L	Introduction to Organic Agriculture Introduction to Plant Science +Lab	4
PBT 141	Integrated Pest Management	3

Third Semester (17 credits)		
Course Alpha/No.	Course Title	Credits
FG course	Foundation Global Multicultural Perspectives (FG)	3
MG 125 or MGT 135 or BUSN 164	Starting a New Business or Agriculture Entrepreneurship in Hawai'i or Career Success	3
ENG 100 or equivalent	Composition I or FW designated courses numbered 100 or above	3
BOT 101+L or BIOL 171+L	General Botany or Introduction to Biology	4
AG 112 or PBT 200 +L	Introduction to Organic Agriculture Introduction to Plant Science +Lab	4

Fourth Semester (13-16 credits)		
Course Alpha/No.	Course Title	Credits
ICS 101 or BUS 101	Digital Tools for the Information World or Business Computer Systems	3
PBT 264	Introduction to Horticulture and Plant Propagation	3
PBT 210 or GEOG 101	Introduction to Environmental Science or Natural Environment	3
PBT Electives*	PBT Electives	3-6
PBT 290V	Internship	1-4

*Optional, students can take electives on either or both semesters

VI. Enrollment Projections

Leeward CC's lecture-lab classes have a maximum enrollment of 25 students. Consequently, we propose an enrollment limit of 25 students in the AS in PBT program. The enrollment is expected to be 20 students in the first year followed by 25 students thereafter. Low initial numbers are projected due to the fact that careers in agriculture are perceived negatively as the plantation or processing-plant jobs of 25 years ago. Only recently, has there been a surge in the interest in sustainable agricultural practices and food safety and security. Current agricultural careers involve science, technology, and business management and offer good pay with competitive benefits; therefore, more students would be interested in pursuing these careers leading to full capacity enrollment.

After the first year, assuming an on time graduation, there will be 50 students in the program at any given time. By following the recommended schedule, a full-time student will complete the associate degree in four semesters. The program will recruit students from 1) incoming freshmen who are interested in science and agriculture and/or seeking a PBT Associate in Science degree, 2) Non-science majors who are inspired by introductory science and agriculture courses to major in a science, 3) employees and non-traditional students in agriculture, business organizations who intend to gain more skills and experiences in agriculture to expand their job opportunities upon completion of the program. The first cohort, enrolled in Fall 2014 will graduate in the Spring 2016 semester.

VII. Resources Required for Program Implementation

Leeward CC's PBT program has built curriculum, equipment, living laboratory through grant funding (Perkins Title I, National Science Foundation, and USDA funds from the US Department of Labor). Majority of courses required for the new certificates and degree have already been approved. Additional work on course and program development is being supported with the U.S. Dept. of Labor "Trade Adjustment Assistance Community College and Career Training (C3T) grant.

A. Equipment: Leeward CC already owns all field equipment for crop production and landscaping (rototiller, riding lawnmower, aerator, dethatcher, weed whackers, sprayers, blowers and various hand tools). Presently, we have adequate supplies needed for the AS degree to provide requisite hands-on experiences for plant propagation, tissue culture, plant science and landscaping.

C. **Facilities:** The PBT Program has access to the following facilities on the Leeward campus.

Shade House: The College has a shade house that is dedicated to propagation of native and dry land plants. The 49-acre campus includes 1,145 plants, representing 239 species and 174 genera of which over 40% are native to Hawai'i and 20% are endangered.

Living Laboratory: The Living Laboratory offers experiential learning space for students in plant and soil sciences. Students gain hands-on experiences by growing various crops from planting to harvest. The 1,000 square feet garden includes drip irrigation lines and other sustainable production practices.

GoFarm Plot: This is a 10,000 square feet farming area under development which will be used for training future farmers as part of the GoFarm Program (<http://www.gofarmHawai'i.org/leewardcc.html>) with funding from the C3T grant.

Biotech Laboratory: A fully equipped biotech laboratory includes several microscopes, spectrophotometers, pH meters, laminar flow hoods, autoclaves and other equipment and supplies needed for cell and molecular biology, soil science, plant tissue culture and micropropagation.

C. Faculty and academic support: Currently we have one faculty and one academic support staff both of which are funded by the C3T grant. We are requesting to hire one FTE Agriculture faculty beginning Fall 2014. The program will also need the support of 1 FTE field and laboratory technician to maintain the living lab and provide academic support for the program.

D. Supplies: At the moment, majority of the supplies needed have already been purchased through various grant funds mentioned above. However, there will be an estimated \$5,000 per year expense for consumables and maintenance of small equipment.

D. **Resource Sharing:** By addressing workforce demands for certificates, the PBT Program will also create courses that shares faculty and resources with Leeward CC's Office of Continuing Education and Workforce Development (OCEWD). Procedures will be established to allow students to interchange between the credit and non-credit which will be patterned after the Health and Information Technology (HIT) program at the College.

VIII. Measures of Program Efficiency

The Program Efficiency will be measured by the University of Hawai'i Community College Instructional Annual Report of Program Data (ARPD) which includes the following indicators: (a) average class size, (b) fill rate, (c) FTE BOR appointed faculty, (d) majors to FTE BOR appointed faculty, (e) overall program budget allocation, and (f) cost per SSH.

The proposed program will utilize classes already taught at Leeward CC and four new PBT courses. The efficiency of offering those classes will be determined by the standard methods already in place. Efficiency should be high since most of the required classes showed an increasing in number of students. After the program is approved, it is expected to generate a profit in AY 2016 - 2017. The information concerning cost per SSH, SSH/faculty, average class size and other quantitative measures will be available.

IX. Measures of Program Effectiveness

The Program Effectiveness will be measured by the University of Hawai'i Community College Instructional Annual Report of Program Data (ARPD) which includes the following indicators: (a) successful completion (equivalent C or higher), (b) withdrawals, (c) persistence (fall to spring); (d) degrees/certificates awarded, and (e) transfers to UH 4-year universities.

Effectiveness will be evaluated by the number of graduates as well as the number of students following the pathways but obtain shorter certificates (CO or CA), those who may continue their studies and obtain a four-year baccalaureate degree in related fields, and those already in the workforce who have their wage increased. Program effectiveness will be assessed annually by the PBT faculty as part of the program review process. The PBT Advisory Board meets bi-monthly and will assist in assessing the program.

X. Academic Cost and Revenue Template

The template on the following page reflects the costs and revenues for the PBT Program with projected figures for 2014 - 2015, 2015 - 2016, and 2016 - 2017. In the Academic Cost and Revenues Template, expenditures and revenues are projected for three years, Fall 2014 through Spring 2017; the rationale for the projections is provided below.

Figure 1: Academic Cost and Revenue Template

	A	B	C	D	E	F	G	H	I	
1	Academic Cost and Revenue Template - New Program (adjust template for appropriate number of years) (Updated 10/31/12)									
2										
3	ENTER VALUES IN YELLOW CELLS ONLY									
4	CAMPUS/Program		LeeCC/Plant Biol & Trop Agr							
5	Provisional Years (2 yrs for Certificate, 3 yrs for Associate Degree, 6 yrs for Bachelor's Degree, 3 yrs for Masters Degree, 5 yrs for Doctoral Degree)									
6			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6		
7	ENTER ACADEMIC YEAR (i.e., 2011-2012)		2014-2015	2015-2016	2016-2017	2017	2018	2019		
8	Students & SSH									
9	A. Headcount enrollment (Fall)		20	45	50					
10	B. Annual SSH		640	1,440	1,600					
11										
12	Direct and Incremental Program Costs Without Fringe									
13	C. Instructional Cost without Fringe		\$ 58,278	\$ 106,425	\$ 110,775					
14	C1. Number (FTE) of FT Faculty/Lecturers		1.00	1.00	1.00					
15	C2. Number (FTE) of PT Lecturers		0.20	1.40	1.40					
16	D. Other Personnel Costs		\$ 38,148	\$ 39,675	\$ 41,260					
17	E. Unique Program Costs		\$ 5,000	\$ 5,000	\$ 5,000					
18	F. Total Direct and Incremental Costs		\$ 101,426	\$ 151,100	\$ 157,035					
19										
20	Revenue									
21	G. Tuition		\$ 72,960	\$ 175,680	\$ 208,000					
22	Tuition rate per credit		\$ 114	\$ 122	\$ 130					
23	H. Other									
24	I. Total Revenue		\$ 72,960	\$ 175,680	\$ 208,000					
25										
26	J. Net Cost (Revenue)		28,466	-24,580	-50,965					
27										
28										
29										
30	Program Cost per SSH With Fringe									
31	K. Instructional Cost with Fringe/SSH		\$ 120	\$ 89	\$ 83					
32	K1. Total Salary FT Faculty/Lecturers		\$ 51,408	\$ 53,465	\$ 55,805					
33	K2. Cost Including Fringe of K1		\$ 69,401	\$ 72,178	\$ 75,067					
34	K3. Total Salary PT Lecturers		\$ 6,870	\$ 52,960	\$ 55,170					
35	K4. Cost Including fringe of K3		\$ 7,214	\$ 55,608	\$ 57,929					
36	L. Support Cost/SSH		\$ 150	\$ 150	\$ 150					
37	Non-Instructional Exp/SSH		\$ 123	\$ 123	\$ 123					
38	System-wide Support/SSH		\$ 27	\$ 27	\$ 27					
39	Organized Research/SSH									
40	M. Total Program Cost/SSH		\$ 270	\$ 239	\$ 233					
41	N. Total Campus Expenditure/SSH		\$ 300	\$ 300	\$ 300					
42										
43	Instruction Cost with Fringe per SSH									
44	K. Instructional Cost/SSH		\$ 120	\$ 89	\$ 83					
45	O. Comparable Cost/SSH		\$ 156	\$ 156	\$ 156					
46	Program used for comparison.		Natural Sciences							
47										
48	Reviewed by campus VC for Administrative Affairs:									
49										

The **Headcount Enrollment (A)** and **Annual SSH (B)** is calculated based on planning that a cohort of 25 students will enter the program each year except in the first year with 20 students, that students will take a full load of 32 credits each year, and that each year, after the first year, 20 students will graduate. Thus after the first year, there will be 50 students in the program at any given time. SSH is based on students taking 32 credits per year.

Calculations of **Instructional Costs without Fringe (C)** is based on a 9-month faculty at the C2 (Instructor) rank. The first year teaching capacity of 32 credits that calculates approximately 1.20 FTE (32 credits/ 27 credits full load). For the subsequent years, as enrollment doubles, teaching capacity will double to 64 credits or approximately 2.40 FTE (64 credits/27 credits full load). Since courses are taught by a combination of full-time faculty and lecturers, the assumption is made that full FTE is taught by full-time faculty and fractional FTE is taught by lecturers (e.g. 2.40 FTE assumes 1.00 FTE is taught by full time faculty and 1.40 FTE is taught by lecturers). Salary is based on entry 9-month faculty and A range lecturer.

Other Personnel Costs (D) is for one field and laboratory technician to maintain the agriculture equipment and supplies, and to maintain the Living Laboratory.

Unique Program Costs (E) were calculated based upon an estimated \$5,000 per year expense for consumables and maintenance of small equipment.

Revenues generated by Tuition (G) are based on the number of SSH multiplied by the applicable tuition; the tuition was based on the Proposed Tuition Schedule for the UHCC's. [<http://www.Hawaii.edu/offices/app/>]

Instructional Cost with Fringe (K1) (see C).

The **Support Costs (L)** and **Total Campus Expenditure (N)** are from Leeward CC's page on the 2012-2013 UH Expenditures Report. [<http://www.Hawaii.edu/budget/expend.html>]

The program used for **Comparable Cost/SSH (O)**, also taken from the above Expenditures Report, is Natural Sciences.

XI. References

- (1) United State Department of Agriculture, National Agriculture Statistics Service (2013), http://www.nass.usda.gov/Statistics_by_State/Hawai'i/Publications/Archive/
- (2) Office of Planning, Department of Business, Economic Development & Tourism and Hawai'i Department of Agriculture (HDOA) (2012), Increased Food Security and Food Self-Sufficiency Strategy 2012,
- (3) Bureau of Labor Statistic U.S. Department of Labor, Occupational Outlook Handbook, 2012-13 Edition, Farmers, Ranchers, and Other Agricultural Managers, on the Internet at <http://www.bls.gov/ooh/management/farmers-ranchers-and-other-agricultural-managers.htm>
- (4) The Occupational Information Network (O*NET) under the sponsorship of the US Department of Labor/Employment and Training Administration (USDOL/ETA) <http://www.onetonline.org/>

XII. Appendices

A. Appendix A: Letters of Support

UNIVERSITY OF HAWAII AT MĀNOA

College of Tropical Agriculture and Human Resources
Office of Academic and Student Affairs

July 3, 2013

Michael Pecsok,
Vice Chancellor of Academic Affairs/CAO
Leeward Community College
96-045 Ala'Ike
Pearl City, Hawaii 96782

Dear Mr. Pecsok,

My name is Charles Kinoshita, Associate Dean for Academic and Student Affairs, College of Tropical Agriculture and Human Resources (CTAHR), University of Hawaii at Manoa, and I am writing to express my strong support for the proposed Plant Biology and Tropical Agriculture Associate is Science (A.S.) program at Leeward Community College (LCC).

In the past decade, I have teamed with LCC's Dr. Kabi Neupane and Professor Priscilla Millen on several different projects, including our USDA/NIFA-funded Alaska Native/Native Hawaiian Serving Institutions Education Grant and two NSF ATE grants, and numerous outreach activities. I've observed the growth of Plant Biology and Tropical Agriculture courses at LCC and have participated in several meetings of LCC's Plant Bioscience Technology (PBT) Advisory Committee. I also helped in articulating several LCC PBT courses with UH Manoa.

Training the next generation agriculture and natural resource management workforce is critical to ensuring food security and food safety for our State. The establishment of an A.S. degree in Plant Biology and Tropical Agriculture (PBTA) will open a new pathway for students in the central region of Oahu to serve that workforce need and will help PBTA students transition more seamlessly to CTAHR/UH Manoa if they wish to pursue a four-year degree or graduate studies. Establishment of the PBTA program will have the added benefit of allowing faculty and researchers at both LCC and UH Manoa to collaborate even more in the future.

At this point in time, it's critical that faculty, administrators, students and advisors work together to develop a coordinated pathway in agricultural education at the secondary and post-secondary levels to meet pressing needs in Hawaii.

I strongly support the establishment of an A.S. Program in Plant Biology and Agriculture at LCC. I look forward to continuing and strengthening our collaboration as that new program develops.

Sincerely,



Charles Kinoshita
Associate Dean

TWIN BRIDGE FARMS, INC.

P. O. Box 31

Waialua, Hawaii 96791

Michael Pecsok

Vice Chancellor of Academic Affairs/CAO

96-045 Ala'Ike

Pearl City, Hawaii 96782

Dear Mr. Pecsok,

This letter expresses our very strong support for the development of Plant Biology and Tropical Agriculture Associate Science (A. S.) program at Leeward Community College.

My name is Milton Agader. I am the president and co-owner of Twin Bridge Farms in Waialua. We lease 300 acres and employ 22 employees. We grow asparagus all year and sweet onions and potatoes seasonally. We plant yearly around 600 acres of seed corn and 100 acres of sunflowers for Pioneer Hybrid. We also conduct seed potato post harvest tests for seed companies from Minnesota, Western Canada, Idaho and Wisconsin. We plant around 70 acres of these test plots. The post harvest test is a requirement for seed certification.

We have every intention of keeping Twin Bridge Farms operating well into the future. But in order to do so we need to staff our farm with qualified persons who are willing to make the commitment to working on a farm. Most graduates with B.S. or higher degrees tend to seek jobs in civil service or corporate farming. Persons completing an A. S. program in agriculture may find better opportunities working on a small farm like ours.

The public in general wants more local grown produce. The farms need qualified committed workers to produce more local grown products. Leeward Community College has the opportunity to fill that need.

We strongly support the establishment of an AS Program in Plant Biology and Agriculture at Leeward Community College. We will consider future graduates for employment, and encourage current employees to enroll in classes.

Sincerely,



Milton Agader, President



Mr. Michael Pecsok
Vice Chancellor for Academic Affairs
Leeward Community College
96-045 Ala Ike Street
Pearl City, Hawaii 96782

Dear Mr. Pecsok,

This letter expresses my very strong support for the development of a new Associate in Science (AS) degree in Plant Biology and Tropical Agriculture (PBT) at Leeward Community College.

As the Owner and President of Nalo Farms and President of the Hawaii Farm Bureau Federation, I have been a strong proponent of the local farmers, agricultural educators, and in the linking of local chefs with farmers. I have come to realize that my successes have been through the support of others and that it is important to give back to the community to sustain those successes especially to educational institutions that promote opportunities and career pathways into agriculture.

I have closely watched Leeward Community College's PBT program since 2009 and at the request of Dr. Kabi Neupane, I have given a guest lecture in his PBT 100 (Orientation to Hawaii's Agriculture Industry) class. I have also recorded a 10-minute video explaining the sustainability and business successes in Hawaii's Agricultural Industry.

I believe a sound educational pathway for agricultural training at the secondary and post-secondary school levels are imperative in order to meet the needs and sustainability of the community. The establishment of new AS degree in PBT will address a current workforce demand in the ever expanding field of agriculture.

I strongly support the establishment of an Associate in Science in Plant Biology and Tropical Agriculture at Leeward Community College and look forward to continuing and enriching our collaboration as the new program develops.

Sincerely,

Dean Okimoto
Owner and President

WINDWARD COMMUNITY COLLEGE

To Michael Pecsok,
Vice Chancellor of Academic Affairs/CAO
Leeward Community College
96-045 Ala'Ike
Pearl City, Hawaii 96782

Dear Mr. Pecsok,

This letter expresses my strong support for the development of Plant Biology and Tropical Agriculture Associate is Science (A.S.) program at Leeward Community College.

I have spent close to 30 years teaching Horticulture for the UHCC. I have observed the growth of Plant Biology and Tropical Agriculture courses at Leeward CC since 2009. I am the convener of the PCC in Agriculture and the coordinator of the system wide efforts under c3T grant in Sustainable Agriculture.

Our programs will help local Agriculture and Food security of our State. Development of food production has been a top priority for our State government the past few years. This will lead to an expansion of agribusiness and natural resource management leading to job creation .

The establishment of the AS in Plant Biology and Tropical Agriculture will open a new pathway for students in Leeward and Central District of Oahu and further deepen collaboration between our two colleges.

At this point in time, it is critical that faculty, administrators, students and advisors work together to develop a coordinated pathway of agricultural training at secondary and post-secondary school levels to meet community needs. The establishment of the new Leeward Plant Biology and Tropical Agriculture A.S. degree will address a current workforce demand in expanding careers in the field of agriculture.

I strongly support the establishment of an AS Program in Plant Biology and Agriculture at Leeward Community College. I look forward to continuing and enriching our collaboration as your new programs develop.

Sincerely,



David Ringuette

Professor Windward Community College



Hawaii Agriculture Research Center

P.O. Box 100, Kunia, Hawaii 96759
Ph: 808-621-1350/Fax: 808-621-1359
www.harc-hspa.com

June 21, 2013

To Michael Pecsok
Vice Chancellor of Academic Affairs/CAO
Leeward Community College
96-045 Ala'Ike
Pearl City, HI 96782

Dear Mr. Pecsok:

It is with great pleasure that I provide this letter expressing my very strong support for the development of Plant Biology and Tropical Agriculture Associate in Science (A.S.) program at Leeward Community College.

I am the executive director of Hawaii Agriculture Research Center, a non-profit, privately owned research institution re-established in 2008 as a 501c3. Its purpose to maintain, advance, improve and protect agriculture industry in Hawaii and to support the development of agriculture in general, including the support of an experiment station, worker housing and agricultural infrastructure for the industry.

I have closely observed the growth of Plant Biology and Tropical Agriculture courses at Leeward CC since 2009, and attended a few meetings as a member of the PBT Advisory Committee.

The Leeward Community Collage has partnered with HARC in the first 'Seeds for Tomorrow Adventure Camp', and was instrumental in developing the curriculum for this one-week camp. This coordinated effort between LCC and HARC is focusing on creating awareness in students of the many career and job opportunities related to agriculture in genetics, biology, entomology, pathology, etc.

At this point in time, it is critical that faculty, administrators, students and advisors work together to develop a coordinated pathway of agricultural training at secondary and post-secondary school levels to meet community needs. The establishment of new Leeward Plant Biology and Tropical Agriculture AS degree will address a current workforce demand in expanding careers in the field of agriculture.

I strongly support the establishment of an AS Program in Plant Biology and Agriculture at Leeward Community College. I look forward to continuing and enriching our collaboration as your new programs develop.

Sincerely,

Stephanie A. Whalen



Cindy Goldstein, Ph. D
Business and Community Outreach Manager
DuPont Pioneer
Waialua Parent Seed, Kekaha Parent Seed
Kunia Research Center, Waimea Research
PO Box 520
Waialua, HI 96791

July 5, 2013

Michael Pecsok
Vice Chancellor of Academic Affairs/CAO
Leeward Community College
96-045 Ala'Ike
Pearl City, Hawaii 96782

Dear Mr. Pecsok,

DuPont Pioneer extends our strong support to establish an Associates of Science degree program in Plant Biology and Tropical Agriculture at Leeward Community College. The A.S. degree program will allow students to earn a science focused degree and enter the workforce, or provide course work that prepares students to enter a Bachelors of Science degree program leading to a range of careers in farming, landscaping, horticulture, and natural resource management.

I serve as the chairperson of the Plant Biology and Tropical Agriculture advisory committee and other DuPont Pioneer employees have served on the advisory committee and instructed classes. Firsthand knowledge of the PBT program shows the curriculum proposed for the AS degree aligning well with the education and skills desired for our jobs in horticulture, agronomy, seed production, and other fields requiring agriculture science knowledge.

We have had paid interns from the LCC Plant Biology and Tropical Agriculture program work at DuPont Pioneer. These interns have made positive contributions and come to our workplace with skills we desire. They in turn have had many opportunities to learn new processes, gained technical understanding and hands on training, and are gaining experience that can lead to successful transition to employment.

As DuPont Pioneer hires employees to fill positions, we seek applicants with degrees that include life sciences and technical agricultural science. Students coming out of the LCC Plant Biology and Tropical Agriculture program with an A.S. degree will be well suited for careers at our 4 locations in Hawaii.

DuPont Pioneer strongly supports the establishment of the Associate in Science degree for the Plant Biology and Tropical Agriculture program at Leeward Com College.

Sincerely,

A handwritten signature in blue ink that reads "Cindy Goldstein".

Dr. Cindy Goldstein, Ph D



Hawaii Farm Bureau
F E D E R A T I O N

2343 Rose Street • Honolulu, Hawaii 96819
Phone: (808) 848-2074 • Neighbor-Islands: (800) 482-1272
Fax: (808) 848-1921 • Email: info@hfbf.org
www.hfbf.org

June 25, 2013

Michael Pecsok,
Vice Chancellor of Academic Affairs/CAO
Leeward Community College
96-045 Ala'Ike
Pearl City, Hawaii 96782

Dear Mr. Pecsok,

With this letter I would like to express my very strong support for the development of the Plant Biology and Tropical Agriculture (PBT) Associate in Science (A.S.) program at Leeward Community College.

As a Research Scientist and the site Agronomist for DuPont Pioneer seed corn production in Kunia I have been working as a volunteer member of the PBT Advisory committee for nearly 4 years. In addition to serving on the committee I have also been teaching PBT 141, Introduction to Integrated Pest Management, which was offered in the fall 2011 and spring 2013 semesters.

In my professional capacity as Chair of the Hawaii Farm Bureau Federation Environmental Stewardship Committee and a 38-year member of the Hawaii Farm Bureau I see that there is an urgent need for individuals educated in crop science so that the reins of leadership in the agriculture industry can begin to be taken up by the young people of Hawaii. Ramping up the PBT program to the AS status can provide the educational vehicle to prepare students for a vibrant career in Hawaiian agriculture.

As you know we live in very exciting times. Agricultural science and technology are "pushing the envelope" to devise new ways of producing crops so that we can continue to feed an ever expanding population. In Hawaii much agricultural diversification has taken place since the demise of the sugar and pineapple industries. Fruit and vegetable production have increased considerably on Oahu since 1996 and there are a number of new farms that continue to supply fresh produce for the people of Hawaii. From my perspective I see nothing but opportunity for students who are well prepared for a career in agriculture here. Through my association with the PBT program I currently have 2 interns from that program at my site who have an outstanding work ethic and who are contributing positively to the expansion of activities on our farm.

At this point in time, it is critical that faculty, administrators, students and advisors work together to develop a coordinated pathway of agricultural training at secondary and post-secondary school levels to meet community needs. The establishment of a new Leeward Community College Plant Biology and Tropical Agriculture A.S. degree will address a current workforce demand in expanding careers in the field of agriculture in Hawaii.

I strongly support the establishment of an AS Program in Plant Biology and Agriculture at Leeward Community College and I look forward to continuing and enriching our collaboration as new programs develop.

Sincerely,

A handwritten signature in black ink, appearing to read "J. McHugh, Jr.", with a stylized flourish at the end.

John J. McHugh, Jr. Ph.D.
Chair, Environmental Stewardship Committee
Hawaii Farm Bureau Federation



MA`O ORGANIC FARMS

a non-profit `aina-based project of the Wai`anae Community Re-Development Corporation

P.O. Box 441, Wai`anae, Hawai'i 96792 • Tel/Fax. 808-696-5569
info@maoorganicfarms.org • www.maoorganicfarms.org

Michael Pecsok,
Vice Chancellor of Academic Affairs/CAO
Leeward Community College
96-045 Ala `Ike
Pearl City, Hawaii 96782

Aloha Mike:

This letter expresses my very strong support for the development of Plant Biology and Tropical Agriculture Associate is Science (A.S.) program at Leeward Community College.

Established in 2001 in the Wai`anae community, MA`O Organic Farms (MA`O) is a social enterprise non-profit 501(c)3 project of the Wai`anae Community Re-development Corporation. Our mission is to simultaneously grow certified organic fruits and vegetables, and young people educated/empowered to work for a sustainable Hawai`i. Working as a community development mechanism designed to revive agriculture in rural O`ahu, we farm 24-acres in Lualualei Valley growing/supplying over 70-different varieties of fruits and vegetables – in “co-producer” relationships – to local natural foods stores and grocery’s, restaurants, farmer’s markets and through a Community Supported Agriculture (CSA) program with over 160 members. MA`O has become one of the largest growers of organic foods in the State of Hawaii, and the largest by land area on the island of O`ahu.

To empower young people for careers in sustainability we have developed an educational `auwai or pathway to college. Presently our core program is the Youth Leadership Training (YLT), a 2.5-year internship that annually accepts 40 high school graduates. The YLT combines paid work experience on the farm, and matriculates students through an Associates degree program at Leeward Community College (LCC). In addition, students complete a Certificate in Community Food Security that includes an Introduction to Organic Agriculture lab which runs at MA`O. We have been able to rehire five graduates and they are now fulltime employees managing the farm, and are all attending or have graduated with their baccalaureate degrees.

All our interns are highly sought after especially as local food production is going through a major growth spurt in an effort to counter Hawaii’s 85% dependency on imported foods. Moreover, there are now more career opportunities in a wider range of agriculture sub-sectors – from farm-to-table teaching positions with schools and NGO’s; to management positions in retail and food service with specialty and organic foods.

In addition we work in collaboration with a wide range of partners in an effort to get young people college ready, and enthusiastic about careers in organic agriculture. For example, we are working with Kamehameha Schools (KS) to expand programs to the entire Leeward region and this will include farming new areas of land that KS currently owns. We anticipate in support increased numbers of youth into college, and the programs of the Plant Biology and Tropical Agriculture (PBT) department at Leeward CC

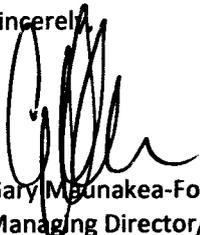
will fit a critically important role both for ourselves in the entire agriculture sector. We look forward to encouraging more and more students to pursue careers in sustainable agriculture via programs like the A.S. in Plant Biology and Tropical Agriculture.

There is obviously a great need and urgency for the PBT. As a State we produce only 15% of our own food, agriculture infrastructure is in decay and had been generally designed for mono-crop production (pineapple and sugar), and the average age of farmers in Hawaii is now over 60-years. On the other hand there are new entrepreneurial endeavors that have stepped into the space and they are looking for motivated/educated young people for entry-level management positions. In addition, there opportunities for more young people to step-up to become entrepreneurs, and large land owners like Kamehameha Schools are anxious to find new young farmers with skills in science, business, conservation and organic agriculture.

At this point in time, it is critical that faculty, administrators, students, advisors and community work together to develop a coordinated pathway in sustainable food production at secondary and post-secondary school levels to meet community needs. The establishment of new Leeward Plant Biology and Tropical Agriculture A.S. degree will address a current workforce demand in expanding careers in the field of sustainable agriculture.

I strongly support the establishment of an AS Program in Plant Biology and Agriculture at Leeward Community College. I look forward to continuing and enriching our collaboration as your new programs develop.

Sincerely,



Gary M. Sunakea-Forth
Managing Director/Co-Founder
MA'O ORGANIC FARMS



June 27, 2013

Michael Pecsok,
Vice Chancellor of Academic Affairs/CAO
Leeward Community College
96-045 Ala'ike Street
Pearl City, Hawaii 96782

SUBJECT: Plant Biology and Tropical Agriculture Associate
Leeward Community College

Aloha Mr. Pecsok,

The Landscape Industry is a strong supporter for the development of the Plant Biology and Tropical Agriculture Associate in Science program at the Leeward Community College.

Hawaii's landscape industry is one of the fastest growing and largest segments of the green industry with an economic impact of over \$520 million annually and full time employment of over 11,000 landscape professionals. The landscape industry is comprised of small local businesses with a high multiplier effect on the economic impact.

Formed in June 1986, the Landscape Industry Council of Hawaii (LICH) is a statewide alliance representing Hawaii's landscape trade associations. Our mission is to build unity by promoting industry guidelines and professionalism through education, training, and certification. LICH has been a leader on sustainability issues including invasive species, water conservation and native species.

The landscape industry has a larger economic impact than agriculture and double the employment work force but has little support in the form of educational programs. Leeward Community College's development of the Plant Biology and Tropical Agriculture department is critical to the landscape industry for their education and pursuit of an Associate of Science in Plant Biology and Tropical Agriculture. Hawaii's major environmental sustainability lies in mitigating the unsustainable development of the urban landscape over the past 50 years; LCC can play a key role in making our islands sustainable.

It is important that faculty, administrators, students and advisors work together to develop a pathway of agricultural training at secondary and post-secondary school levels to meet our community needs. The establishment of a new Leeward Plant Biology and Tropical Agriculture Associate of Science degree will address a current workforce demand in the expanding careers in the field of agriculture and landscape.



The landscape industry strongly supports the establishment of an A.S. Program in Plant Biology and Agriculture at Leeward Community College. I look forward to continuing our support and collaboration as your new programs develop. If you have any questions, don't hesitate to contact me at 799-3101 or chris.dacus@gmail.com.

Sincerely,

A handwritten signature in blue ink, consisting of a stylized initial 'C' followed by a horizontal line.

Chris Dacus
President
Landscape Industry Council of Hawai'i

B. Appendix B: Program Curriculum and Requirements

A. The Associate of Science (AS) in Plant Biology and Tropical Agriculture (PBT)

Awarded to students who complete at least 64 credits of the following courses:

1) Foundation Written Communication (FW) (3 credits required)

ENG 100 Composition I or ENG 100E Composition I or any FW designated courses numbered 100 or above

2) Foundation Symbolic Reasoning (FS) (3 credits required)

MATH 100 Survey Math or MATH 103 College Algebra or any higher FS designated course

3) Foundation Global Multicultural Perspectives (FG) (6 credits required from 2 groups) HIST 151 World History I (suggested) and/or other FG courses

4) Diversification Social Sciences (DS) (3 credits required)

SOC 151 Introduction to the Sociology of Food (DS) (suggested) or other DS courses

5) Diversification Arts, Humanities, and Literature (DA/DH/DL) (3 credits required)

HWST 107 Hawai'i: Center of the Pacific (DH) (suggested) and/or other DA/DH/DL courses

6) Diversification Biological (DB+DY) (4 credits required)

BOT 101+L General Botany or BIOL 101 Biology for non-majors or BIOL 171+L Introduction to Biology

7) Diversification Physical (DP+DY) (4 credits required)

CHEM 151B Elementary Survey Chemistry or CHEM161B General Chemistry

8) Additional Requirements (9 credits required)

ICS 101 Digital Tools for the Information World or BUS 101 Business Computer Systems (3)

GEOG 101 Natural Environment (DP) or PBT 210 Introduction to Environmental Science (3)

MGT 135 Agriculture Entrepreneurship in Hawai'i or MGT 125 Starting a New Business or BUSN 164 Career Success (3)

9) PBT Concentration Requirements (23-25 credits required)

BOT 130 Plants in Hawaiian Environment or HORT 110 Hawai'i Horticulture & Nutrition (4)

AG 112 Introduction to Organic Agriculture (4)

PBT 100 Orientation to Hawai'i's Agriculture Industry (1)

PBT 122 Soil Technology (3)

PBT 141 Integrated Pest Management (3)

PBT 200+ 200L Introduction to Plant Science+ Lab (4)

PBT 264 Introduction to Horticulture and Plant Propagation (3)

PBT 290V PBT Internship (1-3)

10) PBT Electives

PBT 250 Tropical Landscape (3)

PBT 269 Ornamental Plant Materials (3)

PBT 275 Introduction to Crop Improvement (4)

B. The Certificate of Achievement (CA) in Plant Biology and Tropical Agriculture (PBT)

Awarded to students who complete at least 34 credits of the following courses:

1) General education and other requirements (12 credits)

SOC 151 Introduction to the Sociology of Food (suggested) or other DS courses (3)

HIST 151 World History I or other FG courses (3)

HWST 107 Hawai'i: Center of the Pacific (DH) (suggested) and/or other DA/DH/DL courses (3)

MGT 135 Agriculture Entrepreneurship in Hawai'i or MGT 125 Starting a New Business or BUSN 164 Career Success (3)

2) Program focus (22 credits)

BOT 130 Plants in Hawaiian Environment or HORT 110 Hawai'i Horticulture & Nutrition (4)

AG 112 Introduction to Organic Agriculture (4) or PBT 200+ 200L Introduction to Plant Science +Lab (4)

PBT 100 Orientation to Hawai'i's Agriculture Industry (1)

PBT 122 Soil Technology (3)

PBT 141 Integrated Pest Management (3)

PBT 264 Introduction to Horticulture and Plant Propagation (3)

PBT 290V PBT Internship (1-3)

PBT Electives (3-4 credits) from the following list:

PBT 250 Tropical Landscape (3)

PBT 269 Ornamental Plant Materials (3)

C. The Certificate of Competence (CO) in Plant Biology and Tropical Agriculture (PBT)

Awarded to students who complete at least 14 credits of the following courses:

- SOC 151 Introduction to the Sociology of Food (suggested) or other DS courses (3)
- BOT 130 Plants in Hawaiian Environment or HORT 110 Hawai'i Horticulture & Nutrition (4) or AG 112 Introduction to Organic Agriculture (4) or PBT 200+ 200L Introduction to Plant Science +Lab (4)
- PBT 100 Orientation to Hawai'i's Agriculture Industry (1)
- PBT 122 Soil Technology (3)
- PBT 141 Integrated Pest Management (3)

Plant Biology and Tropical Agriculture Core Courses Description

PBT 100 Orientation to Hawai'i's Agriculture Industry (1)

Familiarizes students with different agricultural operations/systems in Hawai'i through lectures, guest speakers and field trips. (lecture/ hybrid)

PBT 141 Integrated Pest Management (3)

Introduction to the principle involved in the control of plant pests including diseases, insects, mites, nematodes, and weeds. Various methods of controlling pests, including the correct method of selecting and applying pesticides will be covered. A presentation on one example of Integrated Pest Management will be required. (6 lecture/lab hrs.) (DB)
Prerequisite: CHEM 151B with a grade of C or better or equivalent or consent.

PBT 122 Soil Technology (3)

Introduction to the physical, chemical, and biological properties of soil and growing media. Learn principles of soil formation, composition, texture, organic matter, soil water, pH, plant nutrients, amendment and fertilizers. Properly manage soil to optimize plant growth. (5 lecture/lab hrs.). Rec Preparation: ENG 22 and MATH 22 or equivalent

PBT 200 Introduction to Plant Science (3)

Introduce students to botany and plant physiology. Learn relation of plants, nutrients, and environment, cultural practices to tropical crop production. (3 hr. lecture) (DB)
Prerequisite: A grade of C or better in a) BIOL 101 or b) BOT 101 and BOT 101L or c) BIOL 171 and BIOL 171L or consent of instructor. Corequisite: PBT 200L

PBT 200L Introduction to Plant Science Lab (1)

Cultivation selected economic crops using seed to seed model in student gardens or greenhouse. Perform field and laboratory tests involving plant, soil and seeds. (3 hr. lab)

(DY) Prerequisite: A grade of C or better in a) BIOL 101 or b) BOT 101 and BOT 101L, or c) BIOL 171 and BIOL 171L, or consent of instructor. Co-requisite: PBT 200 or consent of instructor

PBT 210 - Introduction to Environmental Science (3)

Analysis of the environment with emphasis on understanding relationships and interactions of physical, biological, technological, and political components using scientific methods of inquiry. The subjects include Food supply and safety, water quality, pollution control, biodiversity, environmental policy. (3 lecture hrs.) Rec Preparation: BOT 130L Plants in Hawai'ian Environment or HORT 110 Hawai'i Horticulture & Nutrition

PBT 250 Tropical Landscape (3)

This class introduces students to principle and practice to maintain plant and landscape through the combination of hands-on lab and lectures. (5 lecture/lab hrs.) Prerequisite: ENG 22 and MATH 22 or equivalent

PBT 264 Introduction to Horticulture and Plant Propagation (3)

Introduce various divisions of horticulture with a focus on plant propagation. Learn theoretical and applied aspects of sexual and asexual reproduction of plants. Propagation of selected plants by seed, cuttings, grafting, layering, and micropropagation/tissue culture. (5 lecture/lab hrs.) (DB+DY) Prerequisite: A grade of C or better in PBT 200 and PBT 200L or consent of instructor Rec Preparation: CHEM 151B or equivalent

PBT 269 Ornamental Plant Materials (3)

Identify major ornamental plants used in Hawai'i's landscapes, include trees, shrubs, vines, ground covers, flowers, house plants and natives. Properly select ornamental plants for landscape according to their habits and growing requirements. (5 lecture/lab hrs.)

PBT 275 Introduction to Crop Improvement (4)

Introduces the genetic principles and practices for the improvement of crop plants through lectures and hands-on laboratories, students will learn tools employed by plant breeders to create genetic variation and perform selection on self-pollinated, cross-pollinated and clonally propagated crops. Prerequisite: PBT 200 or equivalent with a C or better or instructor's consent. (6 lecture/lab hrs.)

AG 112 Introduction to Organic Agriculture (4)

This course is an introduction to natural resource sustainability in agriculture. Basic principles of soil science, plant culture, and pest management are explained and organic farming techniques are practiced. The societal, environmental, and business reasons for engaging in organic agriculture are explored. The goal of this course is to increase

understanding of organic farming and to introduce sustainable agriculture practices that can be applied in Hawai'i. (6 lecture/lab hrs.) Prerequisite: ENG 21, ENG 22 and Math 22 with a grade of C or better or equivalent

BOT 130 Plants in the Hawaiian Environment (4)

Understanding principles of how native plants arrived and developed in Hawai'i and the impact on them by man's activities. Lab work includes learning basic plant structure and function, identification of native and introduced plants by visiting natural and garden sites, uses by Hawaiians and importance of tropical plants world-wide. (DB+DY) Prerequisite: ENG 21 and ENG 22 with a grade of C or better or equivalent

HORT 110 Hawai'i Horticulture & Nutrition (4)

Provides hands-on learning in Leeward CC's shade house and gardens in propagation, cultivation, and uses of native, Hawaiian traditional and other cultural plants found in Hawai'i. Proper nutritional principles are applied to plant uses including food preparation. Internet applications for marketing, developing micro-propagation skills, field trips, guest speakers and student projects provide additional active learning opportunities. Lab attendance required. (DB+DY) Prerequisite: ENG 21 and 22 with a grade of C or better or equivalent

Plant Biology and Tropical Agriculture New CO, CA, AS-Proposed curriculum

 UNIVERSITY of HAWAII* LEEWARD COMMUNITY COLLEGE	Academic Subject Certificate Community Food Security	Academic Subject Certificate Plant Biology & Tropical Agriculture	Certificate of Completion (CO) Plant Biology & Tropical Agriculture	Certificate of Achievement (CA) Plant Biology & Tropical Agriculture	Associate in Science (AS) Plant Biology & Tropical Agriculture
ENG 100 Composition or any FW designated courses numbered 100 or above	-	-	-	-	3
MATH 100 Survey Math or MATH 103 College Algebra or any higher FS designated course	-	-	-	-	3
HIST 151 World History I and/or other FG courses	-	-	-	3	6
HWST 107 Hawai'i: Center of the Pacific /or other DA/DH/DL courses	3	-	-	3	3
MGT 135 Agriculture Entrepreneurship in Hawai'i or MGT 125 Starting a New Business, or BUSN 164 Career Success	3	-	-	3	3
SOC 151 Introduction to the Sociology of Food or other DS courses	3	-	3	3	3
AG 112 Introduction to Organic Agriculture	4	-	4*	4*	4
BOT 130 Plants in Hawaiian Environment or HORT 110 Hawai'i Horticulture & Nutrition	-	-	4*	4	4
PBT 100 Orientation to Hawai'i's Agriculture Industry	-	1	1	1	1
PBT 122 Soil Technology	-	-	3	3	3
PBT 141 Integrated Pest Management	-	3	3	3	3
PBT 200+L Introduction to Plant Science/Lab	-	4	4*	4*	4
PBT 290V Internship or work experience	-	1	-	1-4	1-4
PBT 264 Introduction to Horticulture and Plant Propagation	-	3	-	3	3
BOT 101+L General Botany or BIOL 101 Biology for Non-majors or BIOL 171+L Introduction to Biology	-	4	-	-	4
CHEM 151B Elementary Survey Chemistry or CHEM 161B General Chemistry	-	4	-	-	4
ICS 101 Digital Tools for the Information World or BUS 101 Business Computer Systems	-	3	-	-	3
GEOG 101 Natural Environment or PBT 210 Introduction to Environmental Science	-	-	-	-	3
One of the Following Electives: PBT 250 Tropical Landscape (3 cr) or PBT 269 Ornamental Plant Materials (3 cr) or PBT 275 Introduction to Crop Improvement (4 cr)	-	4	-	3-4	3-6
Total	13	27	14	34	64

*Alternative courses (pick one)

C. Appendix C: Courses, Student Learning Outcomes, and Standard Cross-walk

 <p>UNIVERSITY of HAWAII® LEEWARD COMMUNITY COLLEGE</p>	SOC 151 or other DS courses	BOT 130 or HORT 110	PBT 100	PBT 141	PBT 122	PBT electives	HIST 151 or other FG courses	HWST 107 or other DA/DH/DL	MG 125 or MGT 135	AG 112 or PBT 200 +L	PBT 264	290V PBT	FG rom the other group	AG 112 or PBT 200 +L	ENG 100 or equivalent	MATH 100 or MATH 103 or MATH 104	CHEM 151B or CHEM 161B	ICS 101 or BUS 101	BOT 101+L or BIOL 171+L	GEOG 101 or PBT 210	PBT elective
PBT Associate in Science curriculum crosswalk	Certificate of Competence (CO)						Certificate of Achievement (CA)						Associate in Science (AS)								
a. Use appropriate scientific and agricultural terminology to communicate in different settings and with different audiences.						√						√			√					√	√
b. Identify and analyze the biotic and abiotic factors that affect agricultural production and manage these factors at the local, state, national, and global level.				√	√					√	√			√			√		√	√	
c. Understand and apply principles and practices from plant and soil sciences, and tropical agriculture to improve production and profitability.		√	√	√	√					√	√	√		√							
d. Apply scientific methods and information technology to manage agronomic and agribusiness challenges and opportunities.				√	√				√	√	√	√		√		√	√	√			
e. Demonstrate the fundamental knowledge of the contemporary issues involving food, agriculture and the environment.	√	√	√	√	√	√	√	√	√	√	√	√	√	√						√	√



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PBT Associate in Science Program Learning Outcome crosswalk	a. Use appropriate scientific and agricultural terminology to communicate in different settings and with different audiences.	b. Identify and analyze the biotic and abiotic factors that affect agricultural production and manage these factors at the local, state, national, and global level.	c. Understand and apply principles and practices from plant and soil sciences, and tropical agriculture to improve production and profitability.	d. Apply scientific methods and information technology to manage agronomic and agribusiness challenges and opportunities.	e. Demonstrate the fundamental knowledge of the contemporary issues involving food, agriculture and the environment.
Degree Qualifications Profile of Associate Degree					
I. Knowledge					
A. Specialized Knowledge					
Knowledge acquired in a specialized field of study					
1. Describes the scope and principal features of the field of study, citing core theories and practices, and offers a similar explication of a related field.	√		√		
2. Illustrates the field's current terminology.	√				√
3. Generates substantially error-free products exhibits, or performances in the field.		√		√	
B. Broad, Integrative Knowledge					
Knowledge acquired in general education fields					
1. Describes how existing knowledge or practice is advanced, tested and revised.			√		
2. Describes and examines perspectives on key debates within the field and in society.	√				√
3. Illustrates core concepts of the field while executing analytical, practice or creative tasks.			√		√
4. Selects and applies recognized methods in interpreting discipline-based problems.		√		√	
5. Assembles evidence relevant to problems, describes its significance, and uses it in analysis.			√	√	
6. Describes the ways in which at least two disciplines define, address and justify the importance of a contemporary challenge or problem.	√			√	√
II. Intellectual Skills					
1. Identifies, categorizes and distinguishes among ideas, concepts, theories and practical approaches to problems.		√	√		
2. Identifies, categorizes and appropriately cites information for an academic project, paper or performance.			√		
3. Describes how cultural perspectives could affect		√			√

interpretation of problems in the arts, politics or global relations.					
4. Presents accurate calculations and symbolic operations and explains their use either in the field of study or in interpreting social or economic trends.				√	√
5. Presents substantially error-free prose in both argumentative and narrative forms to general and specialized audiences.	√				
III. Applied Learning					
1. Describes in writing a case in which knowledge and skills acquired in academic settings are applied to a challenge in a non-academic setting; evaluates the learning gained; and analyzes a significant concept or method related to the course of study in light of learning from outside the classroom.	√				√
2. Locates, gathers and organizes evidence on an assigned research topic addressing a course-related question or a question of practice in a work or community setting; offers and examines competing hypotheses in answering the question.	√	√	√	√	√
IV. Civic Learning					
1. Describes his or her own civic and cultural background, including origins, development, assumptions and predispositions.					√
2. Describes historical and contemporary positions on democratic values and practices, and presents his or her position on a related problem.	√				√
3. Takes and active role in the community (work, service, co-curricular activities) and examines civic issues encountered an insights gained.					√

D. Appendix D: Proposed Timeline for Program Offering

Performance	Date proposed/ completed
<ul style="list-style-type: none"> PBT board advisory meeting: participants are representatives from both academia and business sections. 	Monthly-ongoing
<ul style="list-style-type: none"> Plant science and Agriculture program coordinators meeting at Windward CC: Leeward CC proposed plan and development of new courses, CO, CA and AS programs in PBT, participants included Kaua'i CC, Hawai'i CC, Windward CC and Maui College. 	March 2013
<ul style="list-style-type: none"> Proposed ATP to CCAO/ The ATP was approved. 	July 2013
<ul style="list-style-type: none"> Leeward CC PBT program and CTAHR coordinators meeting at UH Mānoa: Leeward CC discussed courses curriculum and articulation. 	September 2013
<ul style="list-style-type: none"> Plant science and Agriculture program coordinators meeting at Leeward CC: Leeward CC presented and discussed the development and progress of new courses, CO, CA and AS programs in PBT, participants included Kaua'i CC, Hawai'i CC, Windward CC, Maui College, CTAHR UH Mānoa, and UHWO. 	November 2013
<ul style="list-style-type: none"> Proposed new courses and programs to Leeward CC curriculum committee for approval, to be offered in Fall 2014. 	November 2013
<ul style="list-style-type: none"> New courses and programs were approved by to Leeward CC curriculum committee. 	January 2014
<ul style="list-style-type: none"> Propose new AS proposal to BOR. 	Spring 2014
<ul style="list-style-type: none"> Admission of the students to the programs. 	Fall 2014

E. Appendix E: Strategic Plan for Transforming Agricultural Education in Hawai'i

Strategic Plan for Transforming Agriculture and Natural Resources Education in Hawaii

EXECUTIVE SUMMARY

To effectively meet the workforce needs of the Agriculture and Natural Resource Management employment sectors, we have developed a strategic plan that addresses workforce needs, builds upon existing programs, encourages greater participation by employers, and when implemented, will result in a more cohesive effort between educators and employers. The plan was developed with input from an advisory board that consisted of representatives from the private sector, the University of Hawaii at Manoa, the University of Hawaii at Hilo, the University of Hawaii community colleges, and the Hawaii Departments of Agriculture, Labor, and Education (K–12 public schools). Implementation of the strategic plan will transform Agriculture and Natural Resource Management education in Hawaii to meet the workforce needs related to these fields.

After performing a needs assessment; a political, economic, social, and technological environment assessment; and a strengths, weaknesses, opportunities, and threats analysis; four objectives and corresponding strategic actions were developed and categorized as short term (1–3 years), medium term (3–5 years), and long term (> 5 years). These objectives, described below, are focused around four key areas, 1) public perception, 2) partnerships, 3) student preparation, and 4) articulation.

Objective #1: Create greater awareness and interest in the Agriculture and Natural Resource Management career fields and improve public perception and support.

Objective #2: Develop more effective partnerships between industry and academia. Utilize these partnerships to recruit more students into these careers and to better prepare them for these careers.

Objective #3: Improve the preparedness of students in Agriculture and Natural Resource Management programs.

Objective #4: Develop articulated academic programs for students interested in Agriculture and Natural Resource Management careers.

The key strategic actions are provided in Section 2.

1. SITUATION ANALYSIS

1.1 Summary of Key Drivers for Development of This Plan

Agriculture is the world's largest business. Forecasters estimate a worldwide population explosion within the next decade. Education and ingenuity are essential if we are to provide enough food to feed this population while addressing the effects of climatic change and polluted water supplies and avoiding further damage to the environment. Increasing worldwide population, changes in farming practices, globalization of the economy, and the increasing demands of consumers have created daunting challenges as well as a wide range of career opportunities for the next generation of graduates that work in agriculture-related fields.

Hawaii's overall agricultural output, measured in economic value, has remained relatively constant over the past five years. While production from plantation crops (sugar and pineapple) has shrunk by 13 percent during this period, diversified agriculture production has grown by 9 percent. The State of Hawaii Department of Business Economic Development and Tourism (DBEDT) has identified diversified agriculture as one of Hawaii's key economic strengths (Quarterly Statistical and Economic Report, DBEDT, August 2004). Newly emerging value-added consumer product industries centered on the culinary arts, biotechnology, plant science, aquaculture, forestry, ornamental horticulture, and other agriculture-related fields are quickly becoming important factors in Hawaii's economic growth.

The 2002–2012 Employment Outlook for Industries and Occupations predicts increases in the number of Hawaii jobs in farming, forestry, and fishing and the life and physical sciences (Hawaii Department of Labor and Industrial Relations, 2005). Despite this significant growth, complicated resource issues that include high costs for land, water, labor, and transportation make it difficult for farmers (and investors) to succeed in Hawaii's agricultural industry. In addition, agribusinesses in Hawaii have stated that they are not able to find enough highly qualified graduates with various levels of education to meet their needs.

Agricultural science courses are offered in only a few of Hawaii's high schools. Most courses in agriculture are offered in rural schools as part of a vocational education program or as an alternative for students who are unable to pass the traditional physical science, biology, and chemistry courses. Until recently, most high school agriculture courses focused on traditional farming techniques. Only recently have teachers begun to incorporate more contemporary topics, such as native species propagation, tissue culture, conservation of natural resources, and biotechnology. Several high schools need to update their agriculture curricula.

Only three out of the seven University of Hawaii community college campuses—Hawaii Community College (HawCC), Maui Community College (MCC), and Windward Community College (WCC)—offer Agriculture- or Natural Resource Management-related degrees. A summary of the degrees and certificates related to Agriculture and Natural Resource Management fields is given in Appendix B. Although Leeward Community College (LCC), which services the area of Oahu with the greatest density of agriculture and conservation lands, offers several courses related to Agriculture and Natural Resource Management, it does not offer any degrees in these fields. HawCC and WCC are currently working with

institutions that offer more advanced degrees—the University of Hawai'i at Hilo's College of Forestry and Natural Resources Management and the University of Hawaii at Manoa's College of Tropical Agriculture and Human Resources—to prepare their students for entrance to a four-year program after completing their community-college studies. Efforts to articulate the programs of these community colleges and universities are underway, but more work needs to be done.

1.2 Agriculture and Natural Resource Management Education Needs Assessment

It is apparent that Hawaii needs a larger and more skilled workforce for its Agriculture and Natural Resource Management industries, but meeting this need is complicated by the diversity of skills needed and jobs available. This diversity presents a challenge to the academic programs that are tasked with training this workforce. There are many ongoing activities that have been successful in creating greater interest and more effective instruction in science, technology, engineering and mathematics (STEM) related to Agriculture and Natural Resource Management programs, and it is the goal of this strategic plan to build upon these ongoing activities to meet this workforce need.

The plan was developed with input from an advisory board that consisted of representatives from the private sector, the University of Hawaii at Manoa, the University of Hawaii at Hilo, the University of Hawaii community colleges, and the Hawaii Departments of Agriculture, Labor, and Education (K–12 public schools). A complete list of advisory board members can be found in Appendix A.

Several areas that need improvement were identified by the board based on two Strengths, Weaknesses, Opportunities, and Threats (SWOT) analyses of Hawaii's Agriculture and Natural Resource Management education programs. Separate SWOT analyses were completed from an industry perspective and an academic perspective. The results of these analyses are given in Appendix C. The academic- and industry-focused analyses were combined and each issue prioritized as being of high, medium, or low importance. The prioritized SWOT analysis is presented in the Appendix D. The high-importance needs derived from this SWOT analysis are summarized here:

- ***Better perception of Agriculture and Natural Resource Management careers*** – Most agree that careers in agriculture are perceived largely as the plantation or processing-plant jobs of 20 years ago. The public is not familiar with the array of jobs available in the Agriculture and Natural Resource Management fields. The advisory board generally felt that if students, teachers, parents, and the community understood that many of these careers involve science, technology, and business management and offer good pay with competitive benefits, more students would be interested in pursuing these careers.
- ***Better preparation of graduates entering the workforce*** – Employers have stated that they would like the graduates who are entering the workforce to be better skilled in critical thinking, communications, business management, teamwork, problem solving, and leadership.
- ***Better articulation between high school, community college, and four-year universities*** – It is frustrating for the student who transfers from a community college to a four-year university program to discover that many of the earned credits are not transferrable. It is equally frustrating for the high-school graduate who must take

several remedial courses, which offer no college credit, to enter a desired post-secondary program. High schools, community colleges and universities that offer four-year degrees must articulate introductory courses as well as basic entry requirements to encourage more students to enter and complete Agriculture and Natural Resource Management degree programs.

- ***More sustainable and effective partnerships between industry and academia*** – Many successful projects involving industry and academia partnerships have been developed and completed, achieving impressive outcomes. However, once a project (or its funding) ends and the individuals involved in the project move on to other activities, the partnership usually ends. In these instances, much of the effort expended by the partners is lost, and any future efforts require the formation of a new partnership. It would be much more productive if initial efforts were documented and/or sustained so that subsequent efforts could build upon successful outcomes rather than recreating them.
- ***Better preparation of students entering post-secondary education programs*** – Many students entering the community colleges must take remedial Math and English courses. In many cases, the difficulty encountered in completing these courses is so discouraging that they discontinue pursuing a post-secondary degree.

1.3 Agriculture and Natural Resource Management Education Environment

An assessment of Political, Economic, Skills, and Technological (PEST) environments that would affect Agriculture and Natural Resource Management education was completed. It is important to keep these issues in mind as they can profoundly affect the implementation of this strategic plan. The PEST environment might not change, therefore understanding how to work within the present environment is critical.

1.3.1 Political Environment

Traditional plantation crops that historically dominated agriculture in Hawaii have experienced a dramatic drop in revenue, and diversified agriculture has taken their place. Whereas the large companies of the past had a strong political voice, the many new diversified companies do not. As initiatives like 2050 Hawaii, and DBEDT and EDB push to diversify the economy and work towards self-sufficiency, the timing is right for further political action. Recent partnerships, such as those involved in passing Act 183, are supportive of agriculture, but additional steps are needed. Act 183 provides the standards, criteria, and processes to fulfill the intent and purpose of the Important Agriculture Lands article.

1.3.2 Economic Environment

Agriculture continues to be an important industry in Hawaii, generating \$1.9 billion to the state's annual economy and directly or indirectly providing 38,000 jobs. Hawaii-grown products have gained substantial recognition in foreign and domestic markets, and the local market has expanded in unique ways, such as the development of Hawaii Regional Cuisine that utilizes fresh island products. Trends in Hawaii's leading industry, tourism, show an increasing interest in eco-tourism, agritourism, and cultural experiences; all of which are related to Agriculture and Natural Resource Management. But Hawaii's agribusinesses struggle to find good employees. In addition to the poor public perception of careers in Agriculture and Natural Resource Management, the

overall unemployment rate in the state is low, so competition for good employees is high. Furthermore, global conditions in the post-9/11 world have made immigration of potential employees more difficult. New and innovative solutions are needed.

1.3.3 Social/Cultural Environment

The public perception of agriculture-related careers appears to be outdated, narrowly viewing these careers as simply consisting of strenuous field work. The media has perpetuated this view, and negative associations with the plantation companies persist in the minds of Hawaii residents. Although the departure of these plantation companies makes the news, the rise of diversified agriculture has not. Therefore, the majority of Hawaii residents do not know that diversified agriculture is a formidable industry in Hawaii. In addition, the public has a negative perception of the impacts that agriculture companies have made on the environment.

A recent resurgence of traditional Hawaiian culture has taken place and should create greater interest in the Agriculture and Natural Resource Management fields. Historically, the Hawaiians grew many types of food crops, and created fishponds along the coasts to raise fish and other seafood. Agriculture was central to traditional Hawaiian culture.

Immigrant workers have historically provided a portion of the agriculture workforce, and this remains the case today. Education and incentive programs for these immigrant workers can facilitate their effective integration into Hawaii's workforce.

1.3.4 Technological (Skills) Environment

The transformation of agriculture in Hawaii has resulted in a change in the diversity of skills needed by employers. More training is needed in new technologies related to agriculture, safety, and supervisory and middle management roles. Because there are more small businesses and fewer large companies, a broad skill set and the ability to acquire new skills as needed are more important than targeted knowledge. Problem-solving and the ability to work with members of various cultures are essential. In an exciting development, new distance education technologies provide opportunities for training immigrant workers before they arrive in Hawaii.

2. STRATEGY AND PURPOSE

The plan was developed with input from an advisory board that consisted of representatives from the private sector, the University of Hawaii at Manoa, the University of Hawaii at Hilo, the University of Hawaii community colleges, and the Hawaii Departments of Agriculture, Labor, and Education (K–12 public schools). A complete list of advisory board members can be found in Appendix A.

2.1 Vision

Hawaii's educational institutions, in collaboration with employers, will provide excellent and integrated education programs that meet existing and emerging economic and workforce needs in the Agriculture and Natural Resource Management sectors.

2.2 Strategic Purpose

The purpose of this strategic plan is to transform Agriculture and Natural Resource Management education programs at the high schools, community colleges, and universities in Hawaii, offering updated curricula and professional development for instructors and incorporating strong partnerships with employers to provide a larger and better-trained workforce for the Agriculture and Natural Resource Management sectors.

2.3 Targeted Population

Because there are a wide variety of jobs in the Agriculture and Natural Resources Management fields, students with broad interests could potentially be the targets for the Agriculture and Natural Resource Management education programs. In general, the student who is interested in science or business, and enjoys a variety of work environments (i.e. laboratory, outdoors, and office, not just the office setting) would be interested in these career fields. There are probably many more students who would be interested in these career fields if they were better informed.

2.4 Objectives and Key Strategies for Action

Current efforts will focus around four areas:

- Public perception
- Partnerships
- Student preparation
- Articulation

Objectives and key strategies for action related to these four areas were developed based on the needs assessment, PEST analysis and SWOT analysis. Strategies for action were developed by pairing a strength or opportunity with a weakness or threat from the SWOT analysis. These action items were then categorized as short term (1–3 years), medium term (3–5 years) or long term (> 5 years) based on 1) the priority of the strength, weakness, opportunity, or threat upon which the action item was based, and 2) an assessment of available infrastructure and capacity needed to complete the action item. The strategy combination upon which each action item was developed is given in Appendix E.

Objective #1: Create greater awareness and interest in the Agriculture and Natural Resource Management career fields and improve public perception and support.

Key Strategies (Short term, 1–3 years):

- Publicize successes in the agriculture industry, so that students at all grade levels (Kindergarten through doctoral studies) and members of the public recognize that agriculture is strong in Hawaii and around the nation, thus creating greater interest in careers in the Agriculture and Natural Resource Management fields.
- Publicize the variety of jobs available in the Agriculture and Natural Resource Management fields to correct student and public perceptions of agriculture-related jobs, helping them understand that many of these jobs require advanced skills, utilize new technologies, and offer a wide range of careers with potential for advancement.
- Help Agriculture and Natural Resource Management programs at the high-school and post-secondary levels to highlight the relationship between their disciplines and STEM (Science, Technology, Engineering, and Math). Science, technology, engineering and math has received substantial attention and funding recently. STEM disciplines are part of many areas of study within the Agriculture and Natural Resource management disciplines. This relationship will be publicized more widely in order to improve student perceptions of agriculture careers, create additional career opportunities, and expand opportunities for funding.
- Publicize the steady, long-term economic contribution of Hawaii's agriculture industry, including diversified agriculture, both to help the public understand that Agriculture and Natural Resource Management careers can offer stability, solid income, and opportunities for advancement and to garner support from legislators, the Farm Bureau, and the public. Build upon and publicize Hawaii's unique climate and culture and their relationship to the agriculture industry. Publicize the importance of agriculture for economic sustainability and food security.

Key Strategies (Medium term, 3–5 years)

- Publicize workforce development efforts to garner legislative and public support.

Objective #2: Develop more effective partnerships between industry and academia. Utilize these partnerships to recruit more students into these careers and to better prepare them for these careers.

Key Strategies (Short term, 1–3 years)

- Develop and sustain strong partnerships between educators and employers to update curricula, provide professional development, and increase the number of workforce-ready graduates in the Agricultural and Natural Resource Management fields.
- Help community colleges establish necessary infrastructure so that they can assume the primary role in establishing better coordination between industry and

academia. Develop a mechanism through which partners in this strategic effort can effectively communicate and work together.

- Coordinate UH programs with Hawaii Department of Education Natural Resources Career Pathway efforts.
- Broaden the use of Farm Bureau's efforts/resources to coordinate internships and develop a sustainable infrastructure for better coordination between employers and educators.

Key Strategies (Medium term, 3–5 years)

- Broaden industry's focus on student preparation to include more holistic student development that defines career paths for students and lays the groundwork for future career success rather than just preparing them for immediate employment needs.
- Identify opportunities for partnering between industry and specific DOE school programs, teachers, and principals, especially in rural areas where external funding can be used to help direct students into community colleges and the local workforce.
- Use technology (i.e., innovative delivery modes) to bring industry representatives into the classroom.
- Publicize and build upon previous programs that were successful, to develop additional partnerships.

Key Strategies (Long term, > 5 years)

- Develop partnerships with both small and large companies and agencies that might generate political capital and bring about needed change in agriculture education and the political landscape.
- Build upon and strengthen the partnership between industry and the Hawaii DOE Career Pathways Program.

Objective #3: Improve the preparedness of students in Agriculture and Natural Resource Management programs.

Key Strategies (Short term, 1–3 years)

- Develop and sustain partnerships among high schools, community colleges, and four-year universities to improve student preparation and articulation between the various institutions.
- Assist community colleges, which have the ability to adjust their programs more quickly, to address lack of student preparation.

Key Strategies (Medium term, 3–5 years)

- Identify opportunities to work with landowners, agriculture businesses, and agencies as potential funding sources or partners to support remedial education needs and Agriculture and Natural Resource Management career pathways.

Objective #4: Develop articulated academic programs for students interested in Agriculture and Natural Resource Management careers.

Key Strategies (Short term, 1–3 years)

- Use technology more widely and effectively to overcome geographic isolation of programs and to efficiently utilize resources such as faculty expertise.
- Focus on building upon and articulating existing programs (including those currently offered by industry, e.g., professional certificates) to create a flexible workforce development pathway. At various points along the pathway, students could either choose to continue on to higher levels of education or exit into the workforce. This flexibility would attract more students and would require stronger partnerships between community colleges, four-year universities, and employers.
- Explore the diversity of careers in Agriculture and Natural Resource Management to reach students with varying needs, abilities, and interests. Programs can be developed and/or adjusted to address career ladders rather than just entry-level employment.

Key Strategies (Medium term, 3–5 years)

- Make adjustments to existing programs to better articulate Agriculture and Natural Resource Management career pathways both horizontally and vertically, rather than creating new programs in isolation.

3. IMPLEMENTATION STRATEGY

The success of these actions will depend on the following:

- Willing collaboration among partners working toward a shared mission and vision.
- Obtaining the needed resources
- Flexibility and the ability to change direction if needs change

To pursue these strategic actions, the following resources and partnerships are needed.

3.1 Partners

- University of Hawaii at Manoa, College of Tropical Agriculture and Human Resources (CTAHR)
- Leeward Community College (LCC)
- Pioneer Hi-Bred International, Inc.
- Windward Community College (WCC)
- Hawaii Department of Education – Natural Resources Career Pathways (DOE)
- Hawaii Department of Agriculture (HDOA)
- Hawaii Agriculture Research Center (HARC)
- Department of Labor and Industrial Relations – Workforce Development Council (DLIR-WDC)
- University of Hawaii at Hilo, College of Agriculture, Forestry, and Natural Resources Management (CAFNRM)
- Alluvion, Inc.
- Other important partners: industry professional organizations, state and county Farm Bureaus, additional companies, and other community colleges.

One of the first tasks to be completed in the implementation phase will be closely related to the second component of the second short-term strategic action listed under objective #2, namely, develop a mechanism through which partners in this effort can effectively communicate and work together, in order to achieve the vision and objectives stated in this strategic plan.

3.2 Resources

3.2.1 *Functional Positions*

- Academic/industry liason and internship coordinator or staff
- Instructors (including experts from industry)

3.2.2 *Funding*

- Functional Positions, including stipends and/or salary for guest instructors

- Faculty time to develop new curriculum
- Equipment, Materials, and Supplies
- Subcontractors for marketing and assessment

3.3 Participation

In order to have an impact on workforce development it is critical that all partners participate in carrying out the key strategic actions identified above. The following partners were identified as having the best capability for reaching each objective. The advisory board also brainstormed about what kinds of activities could be carried out in order to reach these objectives. These are summarized below.

Objective #1: Create greater awareness and interest in the Agriculture and Natural Resource management career fields and improve public perception and support.
HDOA, Farm Bureaus, CTAHR, CAFNRM

Such activities might include regular articles and columns in the newspapers, features and commercials on public and network television, podcasts, job shadowing, and more contact with K–12 teachers and the DOE’s Explorations program.

Objective #2: Develop more sustainable partnerships between industry and academia. Utilize these partnerships to recruit more students into these careers and to better prepare them for these careers.
University of Hawaii community colleges (CCs), CTAHR, CAFNRM, DOE, academic advisory boards and/or focus groups, industry professional organizations.

Organizations that might be interested in these activities include professional organizations such as Landscape Industry Council of Hawaii, Hawaii Crop Improvement Association, Hawaii Flower Industry Association, Honolulu Orchid Society, Hawaii Orchid Growers Association, Hawaii Organic Farmers Association, and many others.

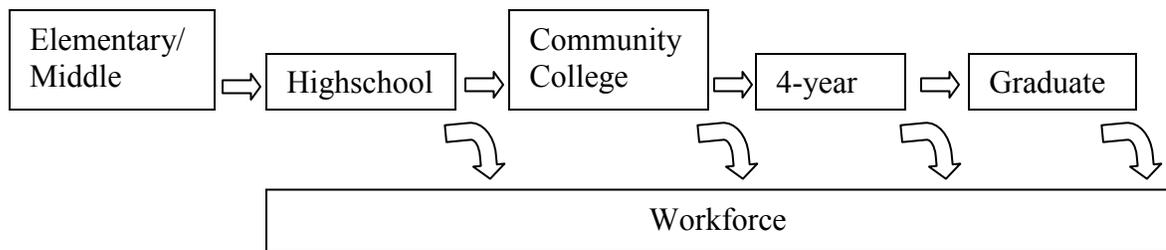
Objective #3: Improve the preparedness of students in Agriculture and Natural Resource Management programs.
CCs, CTAHR, CAFNRM, DOE, academic advisory boards and/or focus groups, industry professional organizations.

It was suggested that these partners become more involved in initiatives such as the P-20 and Title 3 initiatives, as well as the DOE’s Natural Resources Career Pathway advisory board, in order to address student preparation.

Objective #4: Develop articulated academic programs for students interested in Agriculture and Natural Resource Management careers.

CCs, CTAHR, CAFNRM, DOE, academic advisory boards and/or focus groups, industry professional organizations.

A model is proposed in which each of the articulated academic programs would naturally flow into the next one but would also include natural exit points from which students could easily enter the workforce. With this model, the articulated programs create a flexible pipeline through which students can enter academic programs or the workforce at all levels.



Additional involvement from employer partners is needed to:

- provide internship positions and mentors
- participate in updating curricula and programs as well as providing instruction, when appropriate and applicable
- provide jobs upon completion of updated programs
- support activities, when possible, with funding

3.4 Alignment with other Agriculture and Natural Resource Management Education Initiatives

Significant and closely related initiatives are currently being pursued by the Hawaii Department of Education and several institutions within the University of Hawaii system and are listed below. In order to maximize resources, every effort will be made to align the implementation of this plan with the activities related to these initiatives.

- Natural Resources Career Pathways – one of six career pathways within the Hawai'i Career Pathway System. The programs of study begin at the secondary level where core and/or cluster courses are offered and will be aligned with postsecondary courses to adequately prepare students for success in these career pathways. The two agencies tasked with this initiative are Hawaii Department of Education and University of Hawaii community colleges.
- Agribusiness Education, Training, and Incubation (AETI) project and consortium – The AETI program seeks to serve both new and existing agriculture businesses in Hawaii, with an emphasis on Native Hawaiian-owned businesses, in an effort to build Hawaii's diversified agricultural market. Supported by a grant that involves a nine-campus consortium, AETI also supports training and education. The consortium's goals focus on education and workforce development, business and community economic development assistance, and market and capacity building.
- Hawaii Future Farmers of America (FFA) – FFA is dedicated to making a positive difference in the lives of students by developing their potential for leadership, personal

growth, and career success through agricultural education. Although participation in the Hawaii chapter has decreased in recent years, new legislative funding and leadership hold promise for changes in the near future.

APPENDICES

A. Advisory Board Members

- College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa
 - Charles Kinoshita, Associate Dean of Academic and Student Affairs
 - Traci Sylva, Faculty, Coordinator
- Leeward Community College
 - Priscilla Millen, Faculty
 - Kabi Neupane, Faculty
 - Michael Pecsok, Vice Chancellor for Academic Affairs
- Pioneer Hi-Bred International, Inc.
 - Cindy Goldstein, Business and Community Outreach Manager
- College of Agriculture, Forestry, and Natural Resources Management, University of Hawaii at Hilo
 - William Steiner, Dean
 - William Sakai, Faculty
- Windward Community College
 - Inge White, Faculty
- Hawaii Board of Agriculture
 - Sandra Kunimoto, Chairperson
- Hawaii Agriculture Research Center
 - Stephanie Whalen, President and Director
- Hawaii Department of Agriculture
 - Melvin Jadulang, Education Specialist
- Hawaii Department of Labor, Workforce Development Council
 - Ann Yamamoto, Executive Director
- Alluvion, Inc.
 - Susan Matsushima, President

B. Inventory of Agricultural Education and Natural Resources Programs in Hawai'i

MAJOR	UHM	UHH	UHWO	HAW CC	HCC	KCC	KAU CC	LCC	MCC	WCC
Agribusiness		B								
Agribusiness Management	C									
Agricultural & Resource Economics	M, D									
Agricultural Technology				C, A					C, A	
Agriculture	B	B								
Agroecology & Environmental Quality		B								
Agroforestry				C, A						
Agronomy & Soil Science	M, D									
Animal Science	B, M	B								
Sustainable Livestock Production		B								
Pre-Veterinary Medicine		B								
Aquaculture		B								
Bioengineering	B, M									
Civil & Environmental Engineering	M, D									
Crop Protection		B								
Ecology, Evolution, & Conservation Biology	M, D									
Environmental Studies	C, B	C		C						
Food Science & Human Nutrition	B, M									
Food Science	M									
Nutritional Science	M									
Dietetics	B									
Food Service				C, A		C, A	C, A	C, A	C, A	
Global Environmental Science	B									
Landscaping										CC
Molecular Biosciences & Bioengineering	M, D									
Natural Resources & Environmental Management	B, M, D									
Resource Development & Policy	B									
Resource & Environmental Economics	M, D									
Resource Management)	Grad C									
Resource Management & Conservation	B, M, D									
Plant & Environmental Biotechnology	B									
General Biotechnology	B									

MAJOR	<u>UHM</u>	<u>UHH</u>	<u>UHWO</u>	<u>HAW CC</u>	<u>HCC</u>	<u>KCC</u>	<u>KAU CC</u>	<u>LCC</u>	<u>MCC</u>	<u>WCC</u>
Plant Biotechnology	B									ASC
Insect and Pathogen Biotechnology	B									
Environmental & Microbial Technology	B									
Aquaculture & Bioreactor Biotechnology	B									
Plant & Environmental Protection Sciences	B									
Entomology	M, D									
Tropical Plant Pathology	M, D									
Plant Tissue Culture		C								
Tropical Horticulture		B								
Tropical Plant & Soil Sciences	B, M, D									
Plant Sciences & Genetics	B									
Plant Production & Management (Horticulture)	B, minor									
Environmental Soil Sciences	B									
Horticulture	M, D									
Plant Science	M, D									
Soil Science	M, D									

B = Bachelor's degree

D = Doctorate

C = Certificate

UHM=University of Hawaii at Manoa

UHWO=University of Hawaii West Oahu

HCC=Honolulu Community College

KauCC=Kauai Community College

MCC=Maui Community College

M = Master's degree

A = AssociatesAssociate degree

ASC = Academic Subject Certificate

UHH=University of Hawaii at Hilo

HawCC=Hawaii Community College

KCC=Kapiolani Community College

LCC=Leeward Community College

WCC=Windward Community College

C. Full SWOT analysis for Transforming Agricultural and Natural Resources Management education (Academic Perspective)

Strengths (internal)	Weaknesses (internal)
<p>-Existing programs on all islands Oahu: UH Manoa – CTAHR, LCC – biotech and ethnobotany, WCC – landscaping and bio-resources technology, HCC - aquaculture UH Hilo – CAFNRM, Haw CC – agriculture technology and agro-forestry Kauai CC - agribusiness and Maui CC – agriculture technology -Comm. Colleges are able to adjust to quickly to meet workforce needs -Currently, there are a number of partnerships that support transformation of agriculture education such as the Agribusiness, Education, and Incubator Training consortium.</p>	<p>-Funding reliance, for past efforts, has been on state grants and therefore programs tend to die when the funding source runs out. -Coursework in agriculture education is not well articulated across the UH educational continuum. -Post-high students are not being taught the core set of skills that are desirable to industry, such as business and marketing, management, and leadership. -Innovative delivery modes (e.g., distance learning) are under-utilized. -Course work does not include enough practical application to real world examples. Deficit in quantity and topics of agriculture in adult education programs. -Inadequate coordination between industry and education for internship programs, e.g. no central contact and straightforward procedures for advertising and recruiting students. - “Insufficient numbers of interested students to sustain agriculture education programs at UH, which “live” on head counts.</p>
Opportunities (external)	Threats (external)
<p>-Several sources of funding available, e.g., Dept of Labor and legislative support.(but a plan for sustainability beyond these funding sources is important) -There are instances of successful industry/education partnerships that support the transformation of agriculture education and could serve as models for a comprehensive, larger efforts, such as: -DOE Natural Resources Career Pathway -FFA -Hawaii Agriculture Education curriculum project -There is a need for workers at all levels for existing Ag industry as well as for future Ag-related industries, e.g., bio-energy, food safety. -A new DOE point of contact has been retained by the state for the development of Hawai'i agriculture education programs in public schools – this person will be partnering with current strategic planning efforts.</p>	<p>-Geographic isolation between programs and students on different islands. -For the Leeward coast, the current population has 1/3 the education level as compared to the rest of the island. -Employers require a diverse set of skills and the Comm. Colleges may not be able or find it practical to develop those diverse skills. -The perception of UH is that they are not responsive enough to industry needs. -Agriculture careers are viewed as lacking prestige, as dead-end, and are not science-related. -Students, coming from DOE schools, are poorly prepared in the core areas of reading and math for post-high work. -High school Ag programs are “dumping grounds” for low-level students in the DOE. -DOE, in prior Ag. Ed. efforts, has been resistant to collaboration. -Potential future opportunities in Ag. Industries are not identified as growing areas by the Dept of Labor.</p>

Full SWOT analysis for Transforming Agricultural and Natural Resources Management education (Industry Perspective)

Strengths (internal)	Weaknesses (internal)
<ul style="list-style-type: none"> -Diversified Ag has replaced pineapple and sugar and is a strong force. -There have been some small, focused programs between industry and agriculture education programs that have had successful outcomes. -Industry is willing to partner/participate in intern programs, as long as there is good structure, and directly leads to the development of a trained workforce. -Industry is willing to provide access to industry sites for education and training purposes. -There are a good variety of jobs and opportunities that exist within agriculture and natural resources industry. -Significant internal expertise/resources among Hawai'i's agriculture and natural resources industry. 	<ul style="list-style-type: none"> -Currently, numbers of programs between Ag. Industry and education that exist are very small. -Ag industry, as a political force, is small and unconnected - lacks coordination and presence needed to effectuate change in political arenas and properly represent agriculture education related interests. -Ag. Industry is insufficiently staffed to exclusively coordinate internships or recruit from the education sector – strong reliance on the volunteer model for the development of partnered programs. -Industry may have a narrow focus for partnerships – confined to “what will we get out of this immediately”? -Need to recognize that professional development of students and human capital is important for long term career development. -Although there is job variety and opportunities within agriculture and natural resources, these jobs do not receive the media press they need. -Geographic limitations/isolation of some industries makes educational partnerships difficult.
Opportunities (external)	Threats (external)
<ul style="list-style-type: none"> -Legislative initiatives for Ag. Lands are strongly embraced by people. -Currently, there are efforts within the Farm Bureau to organize a shared voice among Ag & Nat. Resource management employers. -Many partnership possibilities with Ag industry organizations that support the transformation of education exist: <ul style="list-style-type: none"> -DOE Natural Resources Career Pathway -Ag in the classroom/Speakers Bureau -Biotech in the classroom -Career Kokua -Potentially advantageous for large landowners (KS, Campbell) to support educational activities as they have available lands for lease that could improve their land assets. -Bio-energy has become a “hot need” for Hawai'i and the nation. -Technology (e.g. distance ed) has opened opportunities to educate the workforce and overcome geographic limitations. -Some positive media attention exists for Ag. – It is just not at the forefront. -There is potential to unify Diversified Ag. around common issues such as land, water, workforce, and education. 	<ul style="list-style-type: none"> -Perception of agriculture careers as dead end jobs that require hard labor and long hours. -Negative perception of employers - Pineapple and Sugar industries, as the primary Ag. employers in Hawai'i over the last century, were seen as the “bad guys”. -Current low unemployment rate means workers can be choosy about the jobs they take. -Affordable housing is needed and unavailable for service like trades in Ag. Industry. -Opportunities for industry to reach out. into DOE to change perceptions and build student interest early may be unavailable due to resistance from DOE. -Successes depend on strong relationships between Education and Industry; feedback suggests that levels of trust are low. -Politically, Ag. Legislation that could benefit the partnership between Education and Industry, takes a long time to pass. -Currently, Ag related jobs are not listed as one of the “hot jobs” or fastest growing labor force opportunities.

D. Analysis and prioritization of Strengths, Weaknesses, Opportunities, and Threats.

	Strengths	Opportunities
High	Strong diversified Ag is important in determining a range of educational skills needed for the wide variety of jobs	Many potential partnership possibilities between Ag Industry, DOE, Organizations
	Industry is willing to partner/participate through the facilitation of internships, providing expertise, etc. as long as there is a good infrastructure that supports this partnership	Positive media will create greater interest by students in Ag and Nat Resources
	Community Colleges are able to adjust (quicker) to changing needs	There is public support and legislative support for Ag Lands initiatives
	Good Ag jobs and good variety of ag jobs needs to be portrayed in the media for bolstering the image of Ag which is not very positive	Newly hired DOE contact for ag and natural resources
	There currently exists multiple agriculture and natural resource management education programs on all major islands (UHM, UHH, LCC, WCC, HawCC, KauCC, MCC, HCC)	Opportunity to identify as a STEM program which is receiving much attention and funding.
		Need for workers at all levels for existing ag industry and future ag-related industries, e.g. bioenergy, food safety
Medium	Diversified Ag is a growing force	Farm bureau's efforts to organize shared voice among ag and nat. resource mgmt employers
		Innovative delivery modes/Technology (Distance Ed) is important to meet education needs and is more commonly used to overcome geographic isolation
Low	Significant internal expertise is not as high priority for workforce development	External sources of funding not critical because too transient
	Past small and focused programs between industry and ed programs have been somewhat successful in providing interesting curricula in the schools	Potential advantages for large landowners to support ag ed initiatives but they aren't necessarily interested
	Number of existing partnerships don't matter if they aren't effective and sustainable	

	Weaknesses	Threats
High	Articulation from high school to Higher Ed & from 2 year to 4 year programs is critical but minimal or lacking	Ag Ed careers viewed as dead end
	Better coordination between industry and academia is needed.	High School programs perceived as dumping grounds
		Overall perception of Ag Industry and courses of study is negative
		Lack of student preparation - remediation is often needed.
		Lower education levels in the rural areas
		Opportunities for industry to reach down to DOE to create a pipeline of well trained employees, but resistance and confusion is often encountered
Medium	Internship coordination with a sustainable infrastructure is lacking	Low unemployment
	Narrow focus of industry on partnerships. Need to broaden focus and recognize that professional development of students is important for long term.	Diverse skills needed by employers
		Perception of UH as unresponsive to short-term needs
	Past small and focused programs between industry and ed programs, even though successful, have not had a significant impact on workforce development	Potential future career opportunities in Ag are not identified as growing areas by the Dept. of Labor.
Low	Head counts will increase if other successes for Ag are realized	Negative perception of employers (pineapple and sugar industries)
	Reliance on grants and temporary funding, thus program dies when funding ends. If infrastructure exists, additional funding can be pursued	Lack of affordable housing - true for all industries in Hawaii
	Ag industry, as a political force, is small and unconnected therefore unable to effectuate change. But there still exists strong support in the legislature	Ag legislation takes a long time or doesn't happen
	Innovative delivery modes underutilized	
	Geographic isolation	
	Post-high students are not being taught the core set of skills that are desirable to industry (i.e. business and marketing, management and leadership)	

E. High-level action items and strategy combinations

Short term (1–3 years)

Action Item	Strategy combination
Successes in the agriculture industry will be better publicized to create greater interest in Agriculture and Natural Resource management	Weakness/Opportunity
Strong partnerships between educators and employers will be developed and sustained in order to develop updated curricula, professional development, and workforce-ready graduates in the Agricultural and Natural Resource Management fields.	Strength/Opportunity
Partnerships between high schools, community colleges and 4-year universities will be developed and sustained to address the lack of student preparation and articulation between the various institutions.	Weakness/Opportunity
The variety of jobs available will be better publicized in order to increase public perception and public support, and correct the perception of students and public that ag-related jobs don't require a high level of academic rigor and preparation	Strength/Threat
Agriculture and Natural Resource Management programs will identify w/ STEM (Science, Technology, Engineering and Math) programs at high school and post-secondary levels, in order to change the face of agriculture careers; change the perception of dead-end jobs; possibly create additional career opportunities; and pursue additional funding.	Opportunity/Weakness or Threat
Community colleges will become the conduit for better coordination between industry and academia	Strength/Weakness
Diversity of careers will be explored to reach students with varying needs, abilities and interests. Programs can be developed to address career ladders.	Strength/Weakness
Build upon existing programs in order to increase head counts and create more partnerships	Strength/Weakness
Technology will be used to overcome geographic isolation and more efficiently utilize resources.	Opportunity/Weakness or Threat
Broaden use of Farm Bureau's efforts/resources to coordinate internships & sustainable infrastructure for better coordination between employers and educators	Opportunity/Weakness or Threat
Publicize the economic contribution of the growing diversified ag industry to overcome perception that ag ed careers are dead end and to garner support from legislators, the Farm Bureau and the public.	Strength/Threat or Opportunity
Community colleges, with their ability to adjust quicker will be tasked to address lack of student preparation	Strength/Threat
UH programs will collaborate with Hawaii Department of Education Natural Resources Career Pathway efforts.	Strength/Opportunity

Medium term (3–5 years)

Action Item	Strategy combination
Use existing programs to better articulate, both horizontally and vertically, ag ed pathways, instead of creating programs in isolation.	Strength/Weakness
Publicize workforce development efforts in order to increase political clout of ag industry and garner legislative support.	Strength/Weakness
Assess opportunities to work with large landowners, as potential funding sources or partners, to support remedial issues and ag ed pathways.	Opportunity/Weakness or Threat
Identify opportunities for partnering between industry and specific DOE school programs, their teachers and principals, especially from rural areas, in order to help feed students into community colleges and the workforce.	Strength/Threat
Use technology (innovative delivery modes) to partner with and to bring industry into the classroom.	Strength/Opportunity
Use small focused successful programs from the past to develop further potential partnership possibilities	Strength/Opportunity

Long term (> 5 years)

Action Item	Strategy combination
Use existing successful partnerships to broaden industry's focus on student preparation to include more holistic student development that defines career paths for students and sets them in motion rather than just preparing them for immediate employment needs.	Opportunity/Weakness or Threat
Explore partnerships with large landowners who might provide political force and bring about needed change in ag ed and political landscape	Opportunity/Weakness or Threat
Explore partnership between industry DOE system as a whole.	Strength/Threat