FY 2006 Annual Report of Accomplishments and Results

Agricultural Experiment Station, University of the Virgin Islands

Submitted by:

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Goal 1: An agricultural system that is highly competitive in the global economy

A. Overview:

AES is submitting this report under Goal 1 because it is the most appropriate and applicable to our research programs. The work conducted by AES scientists is production oriented and fits well within the description for Goal 1. The small size of AES and limited physical and fiscal resources limit our ability to expand into areas covered by the other goals. One area that we acknowledge being insufficient in is economic analysis of our research results which would aid scientists in determining the impact of their work. All research faculty are encouraged to include an economic analysis, where appropriate, in their projects to help determine the potential benefits the work would have for local producers. In some cases this is not possible due to the nature of the project or the area of research. In other cases it is due to a lack of expertise in this area within AES. The second issue has been addressed by developing collaborations with outside resources (VI Dept of Agriculture, UVI Small Business Development Center, professionals at other institutions) for economic and marketing analysis.

The AES Animal Science Program presented a workshop for sheep producers in Hawaii at the invitation of the Livestock Extension Specialist. Approximately 30 people attended the workshop which focused on hair sheep, animal health and marketing of livestock. The Animal Science Program has also been involved in assuming the management of a herd of Senepol cattle that was donated to the University in early 2006. The herd will be able to stay on the ranch property with access to the working facilities. The Animal Science Program Leader, who is also the Assistant Director of AES, represented AES in a consortium of insular land grant schools to submit a grant to the USDA-CSREES program funding projects in resident instruction and distance education. The grant was funded and will be used to support students interested in doing research in the AES labs. Staff vacancies within the Animal Science Program have hampered progress on several projects during the past year. With only three professional staff positions, and one of them being vacant for the entire reporting period, it has been difficult to make progress in the field and the laboratory. The program hosted a volunteer undergraduate pre-vet student (daughter of a UVI Faculty member) during the summer of 2006. The student gained experience in managing and handling sheep as part of her assignment.

The AES Aquaculture Program conducted its 8th Annual Aquaponics and Tilapia Aquaculture Short Course in two 1-week sessions. The 35 participants in total came from two territories (Puerto Rico, Virgin Islands), 17 states (Alabama, Arizona, California, Colorado, Florida, Georgia, Hawaii, Indiana, Louisiana, Ohio, Oklahoma, New Jersey, New York, Maine, Minnesota, Pennsylvania, Texas) and six countries (Bahamas, Barbados, Jamaica, Republic of Benin, Singapore, Trinidad). Since its inception in 1999, the aquaponics short course has attracted 208 students from 33 states in the U.S., four U.S. territories and 30 countries. The students have started successful commercial operations, initiated research programs and incorporated aquaponics into school curricula. The aquaculture program leader was invited to participate in conducting aquaponics workshops in Brisbane, Sydney and Melbourne, Australia.

The AES Biotechnology & Agroforestry Program focused on selection for bacterial disease tolerance in papaya and field evaluation of 18 pineapple varieties. Papaya was a feature in the annual Agricultural Food Fair and farmers, as well as the general public, were able to observe

papaya varieties with potential for the Virgin Islands. Medium to large–fruited varieties with thick flesh color from yellow to red were displayed. Seeds were made available to those interested in growing papaya. Pineapple plants, grown and propagated through tissue culture, were established in field trials.

The AES Horticulture Program continued conducting research to support the horticultural industry in the U.S. Virgin Islands (USVI). Studies were conducted on micro-irrigation strategies to optimize water use and crop production and on variety performance under sustainable production system with focus on virus resistance. In addition, the horticulture program participated in the Mango Melee festival, VI Agriculture and Food Fair and the World Food Day with displays and assistance for tropical fruit tree production and micro-irrigation systems. Three undergraduate students assisted in the horticulture program conducting studies on irrigation of horticultural crops and testing plant tissue for nutritional status.

The AES Forage Agronomy Program, in conjunction with the Horticulture Program, has collaborated with the University of Florida and obtained funding through the USDA-CSREES Integrated Organic Program to conduct a project evaluating organic production of vegetable crops in the USVI. The researchers are partnering with the Virgin Islands Institute of Sustainable Farming to conduct the project on their land. Filed days and open houses are planned to provide opportunities for local farmers to see the methods and benefits of organic crop production.

By conducting workshops and participating in local outreach activities AES staff members have provided information to a large portion of the local stakeholders. In addition, this information was also made available to individuals who are from outside the region, but were interested in the topics being presented. Feedback from farmers on how they have incorporated the technology into their existing operation is one way that AES staff is able to gauge the success of the workshops and seminars. By attending these outreach activities AES scientists also get input from the farming community regarding the issues that they feel are important and need to be incorporated into the research programs.

Most of the planned programs have made progress in their areas of research and achieved many of the performance goals set out in the 5 year Plan of Work. Scientists presented 15 abstracts on their results at regional, national and international conferences, published 3 peer reviewed manuscripts, contributed to 6 conference proceedings, and presented 5 seminars and workshops. Contacts with individual stakeholders are not recorded consistently, as this is more of an outreach function of CES, but it is estimated that AES faculty and staff interacted directly with over 300 individuals during the year. This includes producers, farm site visits and tours of AES research facilities given to school groups and other interested parties.

The Animal Science Program has become more involved in research beef cattle through multistate projects and the donation of a beef cattle herd to AES. The dairy industry on ST Croix went out if business in July 2006 but research will continue as part of a multistate project by offering data analysis of hair coat color of cows at other locations. There is still the difficulty with a staff vacancy within the program. The hair sheep research program is progressing and dealing with developing issues that are important to the producers, such as the use of crossbred

animals for the production of meat. The Forage Agronomy Program is evaluating new varieties of forage for use by livestock producers. They also conduct animal performance studies to determine how livestock will do when grazing the new varieties of forage in collaboration with the Animal Science Program and stateside institutions. The Aquaculture Program is branching out into shrimp production along with tilapia in order to provide a variety of crops that producers can grow for the local and regional markets. The Horticulture Program continues to conduct some variety trials that are very important to local producers because they provide information on which varieties of a particular crop (vegetables, herbs and fruits) grows well under tropical conditions along with other information on how to achieve the best levels of production for these crops. Biotechnology and Agroforestry is evaluating germination and management practices for endangered tree species that can be used in landscaping. They are also working with some genetically modified plants that have enhanced disease resistance (papaya) or quality traits (cassava).

Given the small size of AES, faculty are encouraged to develop collaborations with scientists at other institutions. This has worked well for the programs and allowed them to access resources that are not available locally. It has also led to an increase in the demand for AES scientists as evidenced by the increasing number of requests to be invited speakers at a variety of national and international meetings, conferences and workshops.

Funding and FTE (also indicated for each program activity below) for these programs was as follows:

Type	Federal	Local Match	FTE
Hatch	$669,813	$399,000	13.5
Regional	$114,719	$104,225	5.5
McIntire Stennis	$51,351	0	1.0

Key Theme - Animal Production Efficiency

a. A multistate project (S-1023 - Enhancing production and reproductive performance of heat-stressed dairy cattle) is a continuation of S-299. Because of the environmental conditions on St. Croix heat stress has a major impact on the reproduction and production traits of dairy cattle and the producers are very aware of the problem and are seeking ways to alleviate it. Due to staffing vacancies (1 professional staff positions vacant for the entire year) and the added duties of the Animal Scientist (serving as Assistant Director of AES) there was no progress made on this project during this year. Images for coat color analysis were received from collaborators in Mississippi and Puerto Rico but they were not processed because of a lack of a technician. The administrative duties of the PI have decreased after the return of the Director as well.

b. Impact – There is no impact to report at this time because the new project is in the first year.

c. Source of Federal Funds – Hatch Multistate Research (1.0 FTE)

d. Scope of Impact - Multistate
    i. With Mississippi

Key Theme - Animal Production Efficiency

a. There is little information on how Dorper x St. Croix White (DRPX) crossbred ewes will perform under tropical conditions. The objective of this project is to evaluate production traits of DPRX ewes in an accelerated lambing system. The DPRX ewes (n = 26) were compared to an established St. Croix White flock (STX; n = 40) over a period of 2 yr (4 lamb crops; 163 births). The DRPX ewes were introduced into the flock for their first lambing in March 2004. Subsequent lamb crops were produced in November 2004, July 2005 and March 2006. The STX ewes were older than DRPX ewes at the first lambing (4.2 vs. 1.0 yr, respectively). Overall there was no difference in the proportion of DRPX and STX ewes that were exposed to rams that lambed (88.7 vs. 80.4 %, respectively). There was no difference between STX and DRPX ewes in weight at breeding (42.4 vs. 43.6 kg, respectively) or weaning (42.5 vs. 45.4 kg, respectively). Number of lambs born per ewe lambing was greater in STX than in DRPX ewes (1.9 vs. 1.5 lambs, respectively). Number of lambs born increased in DRPX ewes from 1.2 to 1.8 between the first and third lamb crops but there was no change in the STX ewes during this time (2.1 vs. 1.9 lambs, respectively). Number of lambs weaned increased in DRPX ewes from 1.2 to 1.8 between the first and third lamb crops but there was no change in the STX ewes during this time (1.8 vs. 1.4 lambs, respectively). Weaning percent was higher in DRPX than STX ewes (95.2 vs. 83.6 %, respectively). Litter weaning weight was higher in DRPX than in STX ewes (22.7 vs. 19.7 kg, respectively). Even though the DRPX ewes had fewer lambs born than STX ewes they produced heavier litter weaning weights. These results indicate that DRPX ewes can be used in an accelerated lambing system under tropical conditions.

b. Impact – Local farmers have begun using crossbred ewes in their flocks for breeding. It is too early to tell if the productivity of the crossbred ewes is benefiting local sheep producers.

c. Source of Federal Funds – Hatch (2.0 FTE)

d. Scope of Impact – Territory Specific

Key Theme - Animal Production Efficiency

a. Participation in the multistate project S-1013 (Genetic (Co)Variance of Parasite Resistance, Temperament, and Production Traits of Traditional and Non-*Bos indicus* Tropically Adapted Breeds) has been limited due to staffing vacancies (1 professional staff positions vacant for the entire year). The acquisition of the cattle herd has taken up a lot of time to develop a management system but some data was collected early in FY 07.

b. Impact – There is no impact to report at this time because of the long term nature of the project.

c. Source of Federal Funds – Hatch Multistate Research (0.5 FTE)

d. Scope of Impact – Multistate
    i. With Mississippi

Key Theme – Aquaculture

a. A preliminary trial was conducted to evaluate three varieties of cantaloupe in a commercial-scale aquaponic system. Results were negatively impacted by a water quality problem. The problem is now clearly understood, and corrective action will be taken in a repeat of the cantaloupe trial. In response to an inquiry from a major medicinal herb producer in Washington State, preliminary observations were made on the aquaponic growth of watercress. The standard raft support system for aquaponic plants was replaced with a submerged screen because watercress reproduces by sending out runners. Using this system, observations were made on the on the growth of watercress, mint and chives in preparation for an upcoming experiment on the production and water treatment capacity of these plants. Tilapia brood stock was produced to renew the line, and thousands of tilapia fingerlings were produced for upcoming experiments. A design was developed for a structure to prevent bird predation, and a new type of bird barrier netting was purchased.

b. Impact – Results of this work will be used by researchers, educators, students and producers to advance the field of aquaponic fish and crop production.

c. Source of Federal Funds – Hatch (4.5 FTE)

d. Scope of Impact – Territorial, Regional, International

Key Theme – Biotechnology

a. Inbred lines of papaya for virus tolerance were grown and selected for continued tolerance to papaya ringspot virus as well as early bearing, within one meter of the ground, and fruit quality. Selections were also made to hermaphroditic plants to eliminate the production of nonproductive male plant. The life of the plot was decreased by the occurrence of a bacterial disease, Erwinia. Though the plants had tolerance to the virus, they were susceptible to the bacterial disease. Selections were made of the strongest plants that indicated tolerance to both the virus and the bacteria. This bacterial disease has become more prevalent in above normal rainfall years

b. Impact – Farmers utilized the disease tolerant papaya lines that are more productive and provides a better return on their investment.

c. Source of Federal Funds – Hatch (1.0 FTE)

d. Scope of Impact – Territory Specific

Key Theme – Germplasm

a. Pineapple, obtained from the USDA Tropical Plant Germplasm center in Hawaii were micropropagated in tissue culture and established in a greenhouse. Because the germplasm center sent two *in vitro* plants per line, micropropagation was needed to increase the plant numbers to conduct field trials. The tissue culture propagation of the 18 pineapple varieties did not cause any noticeable deviations from the original plant material. Over 100 plants of each variety were produced. The plants were established in replicated field trials on campus as well as on a local farmer's plot. The two sites represent two different environments. The campus site has a heavy, high pH soil while the on-farm location has gravely, well drained, slightly acidic soil. The campus plants were overwhelmed by the high soil pH and excessive rainfall for the year on poorly drained soil. However, two varieties of the eighteen Papaya germplasm had tolerance to the high pH soil and grew well. Pineapple normally takes 18 months to bear fruit so only vegetative growth data was obtained. Plant growth was best on the farm site compared to the campus location.

b. Impact – Two pineapple varieties that tolerate high pH soils can be grown by farmers and back yard gardeners on calcareous soils where pineapple production was not possible before.

c. Source of Federal Funds – Hatch (2.0 FTE)

d. Scope of Impact – Territory Specific

Key Theme - Plant Production Efficiency

a. Over the past year, tropical forage legume and grass varieties have been identified through small and large plot trial evaluation that will best suit tropical production of high quality hay production. Initial results indicate that *Clitoria ternetea* (cv. Tehuana) will provide the best quality hay with the highest level of nutrition and digestibility. Results also indicate that hay quality will be the highest using clitoria. That amounts to reduced incidence of leaf shatter, greater uniform hay curing, increased stand viability, and increased nutritional performance. Another legume identified with potential to make high quality leguminous hay is *Lablab purpurious*. This tropical forage legume has larger leaves that tend to stay intact through the curring process. However, lablab does have thicker, heavier stems that tend to contain high moisture and are thus harder to cure. This can result in a higher incidence of mold/mildew accumulation in the bail, internal heating as a result of microbial activity, and an overall drop in hay quality. Velvet bean (Macuna pruriens), has been tested on a limited basis over the past year for its potential role as a viable tropical legume suitable for hay production. Additional tests and plantings will be conducted in the following year to determine hay production potential and incorporation into multiculture (legume/grass) hay production systems. Grass

species that have been identified to produce the highest quality hay are *Bracharia bracharia* (cv. Mulato) and *Panicum maximum* (cvs. Mombaza and Tanzania). Several varieties of sorghum sudan (Sorghum bicolor) have been evaluated for annual hay production. Initial results indicate that sorghum sudan will provide a viable annual hay crop alternative to the perennial guinea grass and bracharia cultivars. Additional research needs to be conducted on various hay cutting times, cutting height, physiological response to cutting, stand longevity, and weed ingress.

b. Impact - As a direct result of this initiative, a farmer's cooperative received a federal grant to do an economic feasibility study that entails the conversion of a closed dairy and surrounding land into an integrated agricultural project for local St. Croix farmers. A major component of this new initiative will encompass 200 acres of hay production. The knowledge gained from this project is being utilized in the feasibility study and has been directly incorporated into the farmer's cooperative plan of work for this project. If the project is initiated then the haying component will be modeled after results determined by this research. This hay will be sold by the farmer's cooperative here on St. Croix and will be exported to St. Thomas and other nearby Caribbean islands.

c. Source of Federal Funds – Hatch (3.0 FTE)

d. Scope of Impact – Territory specific

Key Theme - Plant Production Efficiency

a. The benefit/loss of subjecting Puerto Rican sweet pepper (*Capsicum chinense*) to different irrigation regimes was investigated to optimize water use and production. Limited water resource is a major constraint to vegetable crop production in the USVI since water requirement is high due to high evapotranspiration. Drip irrigation has been used in the USVI as an efficient method to conserve water, but management strategies need to be developed to optimize water use efficiency and crop production. In this study, Puerto Rican sweet pepper was irrigated based on soil moisture at -20, -40, and -60 kPa at 6 in deep (tensiometer). Treatment consisted of 3-row plots arranged in a randomized block design with three replications. Peppers were transplanted and irrigated daily for one week for establishment and then irrigated based on tensiometer readings. Pan evaporation (EP) during the production period (February 1 to June 3) was 749 mm and rain was 159 mm. irrigation water applied used was 28%, 15%, and 9% EP for -20, -40, and -60 kPa, respectively. Although water usage decreased at lower irrigation regimes resulting in an increase of water use efficiency, yield was lower decreasing the economic benefit (net income). In conclusion, to optimize Puerto Rican sweet peppers production, irrigation regimes that maintain soil moisture at or above -20 kPa are recommended.

b. Impact - Production of fruit and vegetables in the USVI is concentrated mainly on the rainy season, but micro-irrigation has helped to expand vegetable production into the dry season. Managing irrigation schedule and applying water according to crop requirements (evapotranspiration) will increase water use efficiency and expand the production season for a year round supply of locally grown vegetables.

c. Source of Federal Funds - Hatch Multistate Research (1.5 FTE)

d. Scope of Impact - State specific

Key Theme - Plant Production Efficiency

a. Irrigation of wax jambu (*Syzygium samarangense*) during flowering and fruit development was evaluated to reduce fruit drop and increase yield. Wax jambu is a minor tropical fruit tree that is performing extremely well in a calcareous soil (pH 7-8) commonly found in the U.S. Virgin Islands (USVI). Flowering and fruit development occur in February through April coinciding with the dry season in the USVI and it takes about 45 days for fruits to mature. When the conditions are favorable, meaning rain, a second bloom and fruit development occur in June through August. Wax jambu has the tendency to over produce and set several fruits in a cluster on a single branch. Excessive fruit setting in conjunction with water stress during the dry season, however, triggers and enhances fruit drop reducing yield. A study was set up in October, 2005 to evaluate micro-irrigation management strategies for optimal fruit production. Irrigation treatments were conducted during flowering and fruit growth and consisted in supplying water to replenish 0.7 and full pan evaporation. Rainfed treatment was the control. Irrigation increased fruit production mainly in the second production cycle compared to rainfed, but there was no difference between 0.7 and full pan evaporation. Similarly, fruit drop was not improved with irrigation suggesting that other factors may be involved. This treatment will be repeated in 2007.

b. Impact - Development of water management strategies to increase fruit production and quality of wax jambu is expected to reduce technical and water management barriers associated with micro-irrigation. Promoting micro-irrigation of fruit trees will increase production in the U.S. Virgin Islands and wax jambu is an excellent alternative for production in marginal calcareous soils commonly found in the islands.

c. Source of Federal Funds - Hatch Multi-State Research (1.5 FTE)

d. Scope of Impact - State specific

Key Theme - Plant Production Efficiency

a. Shade loving anthurium is being used to develop a water sustainable production system for growers in the U.S. Virgin Islands. Crops require substantially less water under shade because of reduced evapo-transpiration. In addition, many tropical high value ornamentals perform better in shady conditions and are highly demanded by the local tourist industry. Rainfall in 2006 was substantially lower than evapo-transpiration particularly during the dry season (January to August). By the end of April, pan evaporation at 60% and 80% shade was reduced to 47% and 32% of full sun pan-evaporation, respectively, and rainfall was 21% (79% deficit). Similar differences in pan evaporation continued until the end of the experiments in November, however, rainfall

deficit was reduced to 53% since the rain was more frequent and heavier. These results suggest that shading is an excellent alternative to reduce crop water requirements in comparison to direct sun production and that it is possible to grow crops in a shade-house modified to catch rainwater for irrigation purposes. Initially, (January – April, 2006) three irrigation regimes based on soil moisture (-10, -30, and -50 kPa) and two shade levels (60% and 80%) were studied for Anthurium cut flower production in 1.44 m^2 beds. Water stress (irrigation at -30 and -50 kPa) with the purpose of saving water was detrimental on flower production and quality. In the second production period, the plots were irrigated daily with 1.1, 2.2, and 3.3 mm water. Yield of flowers was higher at 60% than at 80% shade suggesting that 80% shade may have been below optimum reducing photosynthesis. Within 60% shade yield was reduced with lower amount of water suggesting that irrigation may have been suboptimal. Therefore, evapo-transpiration needs to be satisfied in full for optimum production.

b. Impact - Using shade crops in a semidry tropical climate as in the USVI will improve water use efficiency and impact directly on the water dependency of the horticulture industry. Developing water sustainable production systems with shade loving ornamentals will promote production of these low water requirement crops to be sold to the local tourist industry that will impact favorable on the local economy.

c. Source of Federal Funds - Hatch Multi-State Research (FTE 1.0)

d. Scope of Impact - State specific

Key Theme - Plant Production Efficiency

a. Vegetable variety trials under sustainable production systems were conducted to evaluate cultivars resistant to viruses as well as to determine high yielding varieties adapted to the U.S. Virgin Islands. Tomato, cucumber, summer squash, zucchini, sweet corn, and bell pepper cultivars were evaluated. Yields varied with the variety and incidence of insect and diseases. For spring tomato yield ranged between 13 and 38 t/ha, cucumber yield ranged between 16 and 35 t/ha, summer squash ranged between 4 and 44 t/ha, zucchini ranged between 23 and 59 t/ha, corn varied from 3000 to 7000 units/ha, bell pepper yield ranged between 9 and 16 t/ha, and Caribbean pepper yield was 1 to 3 t/ha. The use of soluble fertilizer with micronutrients improved the nutritional status of the crops. The main problems encountered were melon worm and leaf miner in cucurbits, broad-mite and viral diseases in pepper and tomato, and ear worm in corn. Zucchini and summer squash resistant to zucchini yellow mosaic virus, which is present in the territory, performed above expectation when grown in an isolated area, but papaya ring spot virus was devastating in a trial next to a papaya field. Potyviruses were also detected in cucumbers. Tobacco etch virus incidence in tomato and bell pepper varieties was low, but the incidence in Caribbean peppers (*Capsicum chinense*) was very high and yields were dramatically reduced. Virus resistant varieties are critical to improve vegetable production in the USVI and this project is addressing this need.

b. Impact - Identification of viruses affecting vegetable crops in the U.S. Virgin Islands was

critical to select and test the performance of virus resistant varieties. Recommendation of virus resistant varieties with improve performance will impact favorably the local vegetable industry and economy by reducing imports from the main land and other Caribbean countries.

c. Source of Federal Funds – Hatch (FTE 1.0)

d. Scope of Impact - State specific

B. Stakeholder Input Process

The AES Advisory Council met to discuss issues of concern to the agriculture community and AES scientists continued to work in close contact with farmers as part of several research projects. The Advisory Council is composed of individuals involved in several aspects of agriculture (horticulture, livestock, and farmer's co-ops) from both St. Croix and St. Thomas. Members serve for 2 years and new members are recruited by the AES Director based on suggestions of the research faculty and existing members of the council. Research faculty present information on current projects and members of the Advisory Council express their concerns and opinions about what they see as the needs of the agriculture community. Issues are prioritized within discipline based on the input of the Advisory Council members in their role as representatives of the agriculture community. Some of the high priority issues that came up were assistance with marketing programs and educational programs for farmers. The VI Department of Agriculture has a marketing program that is supposed to be assisting farmers and this was mentioned to the Advisory Council. Local farmers groups are trying to work with the VI Dept. of Agriculture to keep this program going. The council was told that the Cooperative Extension service has offered short courses in both plant and animal production to local farmers, with the assistance of AES faculty. Other specific issues within a field of study brought up by the Advisory Council were discussed with the appropriate research faculty. Research faculty use the feedback from the council when developing future grants and research projects. Priority is given to those ideas that are researchable within the capabilities of the research programs at AES and funding sources. Because of the small staff size and limited scope of our programs not all areas can be addressed. In cases where the topic is outside of the AES faculty area of expertise efforts are made to get information for the stakeholders from other sources and put the stakeholders in contact with other people, either within UVI or outside, who can provide assistance. The small community and high level of contact with farmers help to provide continuous input and feedback from the community regarding the work being done by AES as well as providing a means for identifying the concerns of the agricultural community. The demographics of the USVI are such that all of our stakeholders would qualify as under-served or under-represented populations based on factors such as race, gender, economic status and farm size.

Workshops and seminars on various topics (horticulture, animal science, aquaculture and agronomy) were conducted and feedback was received from individuals, cooperatives and agribusinesses. Question and answer sessions at each event are used to allow the community to bring up issues that they feel are important to the agriculture community and this allows the AES scientists to get input on their research as well. Because of the small size of the agriculture community in the USVI, anyone who contacts AES regarding information on agriculture is considered a stakeholder. In most cases, input from stakeholders is directed at a specific

program and the program leader is charged with deciding how to consider the input and what action to take. The response may be just a simple matter of providing information to the stakeholder in the form of verbal communication or technical bulletins. In other instances it may involve a visit to the farm to provide technical assistance with a crop (plant or livestock) in conjunction with the appropriate CES personnel.

C. Program Review Process

There has been no change made to the process as described in the initial Plan of Work submitted. A scientific peer review process is followed. Scientists submit three copies of their proposals to the Director, who attaches evaluation forms and sends them to three people who are qualified to judge the proposal. At least one of the reviewers is selected from CES. The reviewers are asked to rate the proposals on a scale of 1 to 5, 5 being the highest score, as to relevance and merit of the proposed project to the agricultural sector (justification). The evaluated proposals are then returned to the Director who gives the reviews to the scientist for any needed revisions. The revised proposal is then returned to the Director who verifies the improvements in writing and gives final approval.

D. Evaluation of the Success of Multi and Joint activities

AES has five ongoing multi-state research projects: 1) Plant Genetic Resource Conservation and Utilization (S-009), 2) Irrigation Management for Humid and Sub-Humid Areas (S-1018), 3) Enhancing Production and Reproductive Performance of Heat-Stressed Dairy Cattle (S-1023), 4) Genetic (Co)Variance of Parasite Resistance, Temperament, and Production Traits of Traditional and Non-*Bos indicus* Tropically Adapted Breeds (S-1013), and 5) Reducing Barriers to Adoption of Microirrigation (W1128). In addition, AES has continued to work closely with the University of Puerto Rico and the University of Florida in the Tropical and Subtropical Agricultural Research Program (TSTAR).

AES scientists participate in these projects because they address areas that have been identified as high priority needs of local agriculture community. These priorities are developed through input from the AES Advisory Council as well as other contact with stakeholders in the region. The projects dealing with livestock (S-1013 and S-1023) address issues that are important to the livestock industry in the region (i.e., heat stress on dairy cattle and temperament of tropically adapted breeds of cattle). The projects on irrigation (S-1018 and W-1128) address issues that are of concern to local crop producers because the islands have limited supplies of fresh water and rely heavily on seasonal rainfall. Any effort to minimize water use in crop production is of high interest to producers. The last project (S-009) deals with an issue that is of concern to the local community because it addresses the issue of preserving endangered local plant species such as trees and orchids. These plants have value to the community in landscaping and the ornamental industry. Stakeholders who are benefiting from the work of these projects are under-served or under-represented populations based on factors such as race, gender, economic status and farm size. Data has been collected on each of the plant projects throughout the year and has been presented at various venues.

Evaluation of AES scientists' participation and productivity in these projects is conducted as a part of the annual Employee Performance valuation process of UVI. Items that are reported include attending the annual meeting, serving as an officer, hosting the annual meeting,

presenting a station report at the annual meeting, developing collaborations with other institutions, obtaining grants related to the project topic and publication of results (peer reviewed journals, conference proceedings, abstracts, fact sheets). The Employee Performance Evaluation does not specifically include an evaluation of what the results of projects are but it does allow faculty to report on how the results of their research as part of these and other projects have been applied or adopted. It also provides a means for reporting outcomes and outputs from the projects. The faculty report on workshops they presented in collaboration with CES or the VI Dept of Agriculture, farm visits or technical assistance provided to local farmers during the year and publications resulting from these projects.

In some programs there was a decrease in effectiveness due to staffing vacancies (Animal Science) which are being addressed, while other programs increased their level of effectiveness. The Biotechnology & Agroforestry program has expanded its scope to include more endangered tree species as well as fruit crops. It used information it gained on previous studies to develop methods that are applicable to other species. The Horticulture program evaluated new varieties of crops in projects on irrigation and developed water usage recommendations and management practices for these additional crops.

E. Multistate Extension Activities

Since the requirements of AREERA section 105 only apply to the 1862 land-grant institutions in the 50 states, UVI-AES is not required to include this reporting component in their Annual Report of Accomplishments and Results.

F. Integrated Research and Extension Activities

Since requirements of AREERA section 204 only applies to the 1862 land-grant institutions in the 50 states and the District of Columbia, UVI-AES is not required to include this reporting component in their Annual Report of Accomplishments and Results. In the present UVI system, AES and CES are distinct units within the Research and Public Service component of UVI with each having their own budgets and administrative and operational staff. There are no joint appointments between AES and CES. In the two areas that AES and CES have complementary programs there is some collaboration. The Animal Science Programs in AES and CES collaborate when dealing with the Senepol cattle and related research projects. With the donation of the Senepol cattle herd, there has been an increase in the amount of collaboration between the two programs because the Extension Agent has been working with the cattle owners for many years and will provide assistance to AES in managing the herd. The CES Horticulture position is vacant so there is no interaction presently between AES and CES in that discipline. Representatives of CES and the VI Department of Agriculture provide assistance to AES by participating in the managing group meetings for the integrated model farm project of AES.

There are other instances where AES and CES have collaborated. AES and CES work together on the Virgin Islands Annual Agriculture and Food Fair, a 3-day event attended by nearly 50,000 people. AES and CES created educational displays in the same exhibition area and had staff members present throughout the fair. AES staff assist with the set up of displays and tents for World Food Day activities and AES faculty present workshops and give tours through the research facilities as part of the day long event. CES personnel attended AES seminars, and AES personnel participated in relevant CES workshops. In areas where CES did not have expertise, AES provided assistance in workshops and short courses for the farming community.

AES faculty made three presentations in the Plant Production and 4 presentations in the Small Ruminant Production short courses held by CES. When AES faculty present seminars on their research, attendance is recorded and information is collected to add names of interested people to our mailing lists. These records are maintained so that future seminars, workshops and field days can be brought to the attention of stakeholders.