

FY 2005 Annual Report of Accomplishments and Results
Agricultural Experiment Station, University of the Virgin Islands

Submitted by:

Dr. J.E. Rakocy, Director
Agricultural Experiment Station
University of the Virgin Islands
RR 1 Box 10,000
Kingshill, St Croix VI 00850

Phone: (340) 692-4031
FAX: (340) 692-4035
Email: jrakocy@uvi.edu

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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 25 people attended the workshop which focused on wool and hair sheep and marketing of livestock. At the end of 2005 a local cattle ranch donated their herd of Senepol cattle to the University and the herd will be managed by the Animal Science Program as a research herd. 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 is being used to evaluate and develop infrastructure to conduct more widespread distance education courses in conjunction with the other insular institutions. Staff vacancies within the Animal Science Program have hampered progress on several projects during the past year. With only three professional staff positions, and two of them being vacant for a majority of the reporting period, it has been difficult to make progress in the field and the laboratory.

The AES Aquaculture Program annual short course (Aquaponics and Tilapia Aquaculture) attracted 33 students from two U.S. territories (Virgin Islands, Puerto Rico), 12 states (Alabama, Florida, Georgia, Kansas, Massachusetts, New York, North Carolina, South Carolina, Tennessee, Texas, Washington and Virginia) and four countries (England, Grand Cayman, Mexico and St. Eustatius). A student from the short course subsequently constructed a commercial facility in Kansas using the aquaponic technology developed at UVI. A workshop (How to Build and Operate a UVI Greenwater Tank: An Income Opportunity for Framers) was given to 10 farmers from the Virgin Islands and Puerto Rico. Two members of the program were invited to give a workshop (Designing and Operating Aquaponic Systems) at the International Conference and Exhibition on Soilless Culture in Singapore. The Aquaculture Program continued to work with Michigan State University and the Asian Institute of Technology (AIT) through a CSRP grant in Pond Dynamics/Aquaculture and is overseeing a research grant to study the impact of tilapia introductions on native fish species in Bangladesh. The program leader served on five Ph.D. committees from other institutions (Asian Institute of Technology in Thailand, Central

Queensland University in Australia, Royal Melbourne Institute of Technology in Australia and Rutgers University).

The AES Biotechnology & Agroforestry Program hosted a papaya workshop and field day to allow the public to learn about papaya production and see the varieties selected for production in the US Virgin Islands. Topics covered in the workshop included seed germination, transplanting, spacing, pest identification and control, disease identification and control, fertilization, water and soil conservation through biodegradable mulch and variety selection and fruit quality. Papaya seeds were made available to farmers and home owners. The workshop was conducted on both St. Croix and St. Thomas in collaboration with the CES. The AES Biotechnology & Agroforestry Program, in collaboration with the division of Science and Mathematics, mentored an undergraduate student with research involving pineapple micropropagation. A workshop was conducted on pruning trees in preparation for hurricane season. Home owners, landscapers and utility workers attended the tree pruning workshop and were given an opportunity to apply the classroom lecture with hands-on pruning of native trees.

The AES Horticulture Program conducted a survey of viral diseases was conducted to determine their incidence in vegetable crop production. Also, studies on specialty cut ornamentals production under a sustainable agro-forestry approach in collaboration with UFL are in progress. In addition, the Horticulture Program participated in the Mango Melee festival and VI Agriculture and Food Fair with displays and assistance for tropical fruit tree production and micro-irrigation systems. The Horticulture Program supervised two undergraduate students conducting studies on irrigation of vegetable crops and another student testing plant tissue for nutritional status and disease incidence.

The AES Forage Agronomy Program is not a new program but has had a staffing vacancy in the Program Leader position for the past several years. An acting Program Leader has been appointed to oversee the research activities. The acting Program Leader presented two hay production and management seminars to local area livestock producers and farmers. The program has worked closely with the Virgin Islands Department of Agriculture to establish a hay production management program that is being implemented into their hay program and will provide higher quality hay to small scale local area farmers.

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.

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

Type	Federal	Local Match	FTE
Hatch	\$676,492	\$339,000	11.5
Regional	\$115,719	\$62,225	4.5
McIntire Stennis	\$51,833	\$0	1.0

Key Theme - Animal Production Efficiency

- a. A new multistate project (S-1023 - Enhancing production and reproductive performance of heat-stressed dairy cattle) was started in October 2005 as 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 (2 professional staff positions vacant for most of the year) and the added duties of the Animal Scientist (serving as Acting Director of AES) there was no progress made on this project during this year. Images for coat color analysis were received from Mississippi but they were not processed because of a lack of a technician. The technical support issue is being addressed and replacements are being hired. The administrative duties of the PI have decreased after the return of the Director as well. It is not know how many more years the PI will be able to participate in this project as the dairy industry in the USVI is slowly decreasing. Currently there are only 3 dairy farms on St. Croix and one of them will be out of business before July 2006.
- 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. Dorper crossbred ewes were bred to same breed rams twice during the year and data was collected, but due to staffing vacancies (2 professional staff positions vacant for most of the year) and added duties of the Animal Scientist (serving as Acting Director of AES) there was no analysis of the data during this year. The technical support issue is being addressed and replacements are being hired. The administrative duties of the PI have decreased after the return of the Director as well.
- b. Impact – Local farmers have begun using Dorper rams to produce crossbred lambs and ewes to sell or use in their flocks for breeding. The Dorper crossbred lambs are more

economically efficient when sold for meat. They reach market weight 30 days sooner than St. Croix White lambs and result in \$11/head more as net return.

- 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 hampered due to staffing vacancies (2 professional staff positions vacant for most of the year) and added duties of the Animal Scientist (serving as Acting Director of AES). These limitations led to no data being collected on this project during this year. The technical support issue is being addressed and replacements are being hired. The administrative duties of the PI have decreased after the return of the Director as well. A local cattle owner plans to donate a herd of Senepol cattle to the University and this herd will be used in the upcoming year to collect data for this project. Plans are being developed to take over management of the herd and begin collecting data on the relationship between temperament and production traits of calves, cows and bulls.
- 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 third production trial (Trial 3) was completed with a biofloc system, a 1/20-acre tank (200 m³) that treats the culture water through continuous aeration, mixing, daily solids removal and nitrification (ammonia and nitrite removal) in the water column. A ¾-hp, vertical-lift pump, tilted sideways, creates a circular rotation in the tank, which keeps organic particles (biofloc) in suspension. Nitrifying bacteria, attached to the biofloc, provide excellent water treatment. The tank is aerated with three additional vertical-lift pumps. Five thousand tilapia fingerlings (25/m³) were stocked in Trials 2 and 3. To reduce mortality that occurred in Trial 2 due to predation by herons, orchard netting was installed around the tank perimeter in Trial 3. Two feet of netting was erected vertically at the edge of the tank to remove heron perching sites. Survival increased from 81.0% in Trial 2 to 86.0% in Trial 3. In Trial 2, the daily feed intake leveled off in the middle of the trial and declined slightly near the end in response to a continuous increase of total suspended solids (TSS) levels during the trial, reaching an exceedingly high level of 1,960 mg/liter and averaging 855 mg/liter. Water movement was too rapid for solids to

settle out, but water mixing was essential for good nitrification. A 500-gallon, cylindrical clarifier with a 60% slope and a 50-minute retention time was installed outside the tank and operated for the last 3 weeks of Trial 2. During that period, 792 lbs of solids (dry weight) were removed, and TSS levels decreased to 600 mg/liter. Several other water quality parameters improved, and the fish feeding response increased dramatically. In Trial 3, the external clarifier was operated continuously throughout the trial, and TSS levels did not exceed 550 mg/liter and averaged 317 mg/liter. Water quality remained excellent, and the daily feed input increased throughout Trial 3. Total feed consumption was 10,914 lbs in Trial 3 compared to 10,098 lbs in Trial 2 even though Trial 3 was 19 days shorter than Trial 2 (182 days vs. 201 days). The concentration of nitrate-nitrogen, the end product nitrification, increased steadily throughout Trial 2 to 707 mg/liter, a level that may reduce fish growth. The process of denitrification removes nitrate under anaerobic conditions. Two 6,000-gallon denitrification channels (100 ft x 4 ft x 2 ft deep) were constructed next to fish rearing tank. Two side-streams of culture water were circulated through the channels at retention times of 1 and 2 days. Solids were allowed to accumulate in these tanks, which reduced dissolved oxygen. The 1-day retention channel reduced nitrate-nitrogen concentrations by an average of 20.5 mg/liter while the 2-day retention channel reduced nitrate-nitrogen concentrations by an average of 22.9 mg/liter. The combined impact of both channels reduced nitrate-nitrogen concentrations by 374 mg/liter in the rearing tank. Nitrate-nitrogen levels in the production tank reached a peak of 330 mg/liter in Trial 3. Total harvest weight in Trial 3 was 6,732 lbs compared to 6,028 lbs in Trial 2. The harvest in Trial 3 was equivalent to 134,640 lbs/acre, which is nearly 30 times greater than standard pond production.

- b. Impact – Biofloc systems have the potential of replacing standard pond production in areas with limited water supplies because it requires only 3-4% of the water used in pond culture, and, unlike pond culture, it recovers solids and nutrients, which can be reused for field crop production. Biofloc technology is at a very early stage of adoption. The Aquaculture Program is promoting this technology through short courses, workshops, seminars, conference presentations and demonstration projects on private farms.
- c. Source of Federal Funds – Hatch (4.5 FTE)
- d. Scope of Impact – Territorial, Regional, International

Key Theme – Biotechnology

- a. Tissue culture is being used to micropropagate eighteen pineapple varieties. The pineapple varieties include both traditional Caribbean varieties as well as those used for commercial production for fresh fruit in Central America and Asia. To obtain sufficient plants for field studies, micropropagation of the pineapple was conducted using both liquid and gelled media. Techniques are being developed that can be employed using low tech inputs that results in high pineapple proliferation rates. Following micropropagation, the pineapples are acclimatized in a greenhouse. Acclimatization to the greenhouse has resulted in a 98% survival rate.

- b. Impact – There is no impact from this project as it is still in the early stages.
- c. Source of Federal Funds – Hatch (1.0 FTE)
- d. Scope of Impact – Territory Specific

Key Theme – Germplasm

- a. Papaya germplasm from Columbia, Venezuela, Thailand and Bangladesh were grown and evaluated with varieties selected for the US Virgin Islands. They were evaluated in 3 plant spacing arrangements: 3 m x 3 m, 3 m x 2 m or a 3 m x 1 m double row. The close double row spacing produced fruits equal in size and quality as the 3 m x 3 m widely spaced plants. Cross pollinations were conducted to incorporate the early bearing characteristics into the new papaya germplasm. Breeding and selection continues toward the development of high quality early bearing lines with 1-2 kg fruit. The populations of the Caribbean have a preference for papaya of the larger size. Seeds of selected, early bearing lines are made available to farmers and backyard growers.

Phenologic data for 121 trees from 14 taxa has been recorded for the past five years on plant establishment and growth. These native trees were planted in a demonstration plot on the UVI St. Croix campus and grown as part of seed germination experiments of rare native tree species. Data was recorded on the time to first flowering and time to first fruiting for these species as well as additional observational data on drought tolerance and insect damage. This plot is now a source of seeds for maintaining these rare native species.

- b. Impact – Farmers and back yard gardeners not only from the Virgin Islands but also from the Caribbean region are requesting seeds and growing the selected papaya varieties. Papaya can be seen in the local marketplace year round and available to the local populations. Interest in incorporating native trees into landscapes and roadside plantings has increased. Through the development of the seed germination techniques for these rare tree species, elementary schools have projects to grow the native trees for use in private or government projects. The local Nature Conservancy has used the seed germination protocols for rare native tree species to produce hundreds of native seedlings. The Nature Conservancy has planted dozens of trees each year on the degraded portions of their property as forest restoration.
- c. Source of Federal Funds – Hatch and McIntire Stennis (2.0 FTE)

Scope of Impact – Territory Specific

Key Theme - Plant Production Efficiency

- a. During the first year of the project successive small plot and large scale production plots of various tropical legumes were established for evaluation as possible tropical legume hay sources. Results indicate that tropical legume species harvested for hay require the

incorporation of a mower/conditioner into the harvesting process to allow for the escape of plant moisture at an equal rate from both the leaf and stem component. Without this additional equipment, hay quality is drastically reduced as a result of increased leaf shattering or high levels of mold and mildew both prior to baling and post baling. Of the four tropical legumes tested (*Desmanthus vergatus*, *Glycine max*, *Lablab purpureous*, and *Clitoria ternetea*), it was determined that *Clitoria ternetea* cv. Tehuana would provide the best quality hay. This decision was based upon several key production and growth characteristics exhibited by clitoria that include high biomass production, regrowth after cutting, multiple cuttings per planting, ease in establishment, and better baling characteristics. In addition, it has been determined that minimum till planting of clitoria hay stands yields acceptable levels of clitoria, but weed encroachment is rapid. Guinea grass (*Panicum maximum*) encroachment can reduce overall legume percent at harvest and reduce total number of viable cuttings. Pre and Post emergence herbicide application and/or weed removal by a row cultivator can increase clitoria viability and biomass production. At this time, additional harvesting equipment has been procured and will arrive on St. Croix. The new equipment consists of a John Deere 570 center pivot mower/conditioner and a John Deere hydraulic twin rake. Further experiments will continue to evaluate the use of *Clitoria* as a high yielding tropical legume hay source.

- b. Impact - *Clitoria* was determined to provide the highest quality legume hay which will be utilized by local farmers to increase livestock production capabilities. Steps have been made to provide harvesting system information to farmers and the local Virgin Islands Department of Agriculture on hay production of tropical legumes. Establishment techniques identified by this project allow farmers to increase hay quality and decrease reliance upon costly imported protein concentrate and bulky hay feedstuffs. This results in direct economic savings to local area producers.
- c. Source of Federal Funds – Hatch (3.0 FTE)
- d. Scope of Impact – Territory specific

Key Theme - Plant Production Efficiency

- a. Water requirement of table and cooking bananas in the U. S. Virgin Islands is high due to high temperatures and seasonal wind velocity. These climatic conditions result in high evapotranspiration rates. Limited water resource is a major constraint to crop production. Micro-sprinkler irrigation is an efficient method and technique in conserving water resource in the Virgin Islands. Water supply through irrigation during the dry season increases yield of cooking bananas compared to non-irrigated ones. In addition, using minimum and optimum micro-sprinkler irrigation rates (regimes) reduces total water use of cooking bananas by as much as 50 percent compared to conventional method of irrigation. The response of banana cv. Saba to micro-sprinkler irrigation under fixed schedules (every day for 10 min, every other day for 20 min and every three days for 30 min) was investigated. Bananas were planted in December, 2003 and the first harvest was obtained in July-Sept, 2005. Irrigation frequency of one to three days had no effect on banana growth and yield when the total amount of water was the same.

- b. Impact - Small-scale banana production in the USVI is expanding due to increasing local demands. Adoption of micro-sprinkler irrigation and efficient water use during the dry season has extended production to a year-round system with the consequent increase in yield and economic return for the farmer. Local farmers started using micro-sprinklers in their banana plantation for efficient water use and year-round production. Domestic production and continuous year-round supply is expected to increase and benefit the local economy by reducing imports of this commodity.
- c. Source of Federal Funds - Hatch Multistate Research (1.0 FTE)
- d. Scope of Impact - Territory specific

Key Theme - Plant Production Efficiency

- a. Limited water resource is a major constraint to vegetable crop production in the Virgin Islands since water requirement is high due to high evapotranspiration rates. Drip-irrigation is an efficient method to conserve water in comparison to traditional irrigation systems. Similarly water management strategies in vegetable crop production may also help conserve water, particularly during the dry season. Therefore, three irrigation regimes (levels) based on soil moisture tensions of -20, -40 and -60 kPa combined with soil management practices (bare ground, plastic mulch, and straw mulch) was conducted to evaluate the effect of water stress on Puerto Rican sweet pepper production in the Virgin Islands. Each treatment consisted of 3-row plot arranged in randomized block design with three replications. Puerto Rican sweet pepper response to drip irrigation regimes was determined in terms of plant height, total number of fruits and marketable fruit yield. Total water use was determined at the end of the production season. The 2005 season was unusually rainy, so water usage was low and higher irrigation regimes appeared not to be beneficial for pepper production since yields were the same in all treatments.
- b. Impact - Production of fruit and vegetables in the USVI is concentrated mainly in the rainy season, but micro-irrigation has helped to expand vegetable production into the dry season. Managing irrigation schedules and applying water according to crop requirements (evapotranspiration) increased water use efficiency and expanded the production season for a year round supply of locally grown vegetables.
- c. Source of Federal Funds - Hatch Multistate Research (0.5 FTE)
- d. Scope of Impact - Territory specific

Key Theme - Plant Production Efficiency

- a. Wax jambu, (*Syzygium samarangense*) 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. Flowering and fruit development occurs in early February through April and it takes

about two months for fruits to mature. When the conditions are favorable, a second bloom and fruit development occur in July and 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 in the Virgin Islands, however, triggers and enhances fruit drop reducing yield. A study was set up to evaluate the effect of irrigation on growth, flowering, and fruit production. In addition, the effect of irrigation on fruit drop and fruit size will be evaluated. Treatments consist in trees irrigated at soil moisture levels of 20 kPa and 40 kPa at 12 in deep, and without irrigation (rainfed). Data is being collected on plant growth, and water use. The trial is in progress and production is to be evaluated during 2006. All data will be summarized at the end of 2006.

- 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. In addition, wax jambu is an excellent alternative to reincorporate into production those marginal calcareous soils commonly found in the islands.
- c. Source of Federal Funds - Hatch Multistate Research (0.5 FTE)
- d. Scope of Impact - Territory specific

Key Theme - Plant Production Efficiency

- a. Shade loving anthurium is being used to develop a water efficient cut flower production system for growers in the U.S. Virgin Islands. Crops require substantially less water under shade because of reduced temperature, wind, and evapo-transpiration. In addition, many tropical high value ornamentals perform better in shady conditions and are highly demanded by the local tourist industry. An irrigation study on anthurium cut flower production was set up to evaluate automation and scheduling based on soil moisture levels (-20, -40, and -60 kPa). Soil moisture probes monitor water availability and this information is used by controllers to start irrigation when a set soil moisture level is reached. In addition, the effects of two shade levels (60% and 80% shade) on evapotranspiration and water requirements are being evaluated. Flower production, soil moisture, and irrigation water quantity as well as meteorological data (rain, pan evaporation, light intensity, temperature, etc) are being monitored to determine their association with water requirements under each growing conditions. The trial is in progress and production will be evaluated during 2006. All data will be summarized at the end of 2006.
- b. Impact – Improving automation system application and knowledge about irrigation scheduling and crop water requirement under shade conditions will increase irrigation efficiency and impact directly on the water dependency of the horticulture industry in the U.S. Virgin Islands. Developing water-efficient irrigation systems for shade loving

ornamentals will promote local production of low water requirement crops to be sold to the local tourist industry and will have a favorable impact on the local economy.

- c. Source of Federal Funds - Hatch Multistate Research (0.5 FTE)
- d. Scope of Impact - Territory specific

Key Theme - Plant Production Efficiency

- a. Vegetable variety trials under sustainable production systems were conducted to evaluate cultivars with high yielding potential in the U.S. Virgin Islands. In addition, a virus incidence survey based on symptoms and serological testing (ELISA) was performed to determine the main viruses affecting vegetable crops and their incidence. Heat tolerant field tomatoes were evaluated for summer production (August - September). Snap bean, cucumber, and bell and hot pepper cultivars were also evaluated during the summer. Yields varied with the variety and incidence of insect and diseases. For tomatoes, yield ranged between 500 kg/ha and 9000 kg/ha, bean yields ranged between 2000 and 4000 kg/ha, and bell and hot pepper yield ranged between zero and 7000 kg/ha. The main problems encountered were nutrient deficiency due to high soil pH, insects, and viral diseases. Among the viral diseases detected were papaya ringspot virus and zucchini yellow mosaic virus affecting cucurbits, and tobacco etch virus and pepper mottle virus infecting tomatoes and peppers. Symptoms of other potyviruses and geminiviruses were observed also. The high incidence of viral diseases (100% in pepper and cucumbers) may explain the low yields obtained in these trials and suggests that viruses are an important constraint to vegetable crop production in the Virgin Islands.
- b. Impact – Selection of cultivars with good performance under U.S. Virgin Islands environmental conditions as well as under sustainable production systems will increase yields and the grower's economic returns. In addition, information about viruses present in the territory that affect crop production will allow selection of specific resistant varieties to improve local production. This will impact the local economy by promoting domestic production and reducing imports of vegetable crops.
- c. Source of Federal Funds – Hatch (0.5 FTE)
- d. Scope of Impact - Territory 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).

Evaluation of AES scientists' participation and productivity in these projects is conducted as a part of the annual Merit Review 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). In the Merit Review process AES faculty also report on how the results of their research as part of these and other projects have been applied or adopted. The faculty also report on workshops presented in collaboration with CES or the VI Dept of Agriculture, farm visits or technical assistance provided to local farmers during the year.

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 dairy and Senepol cattle and related research projects. With the donation of the Senepol cattle herd, there will be 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.