2009 University of the Virgin Islands Research Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Under the direction of central administration, AES wrote a strategic plan, a succession plan, a service charter and a plan to develop closer working relations with CES. The Human Resources Department at UVI instituted a new personnel system called PeopleAdmin. AES developed 25 job descriptions, including vacant positions, and entered them into PeopleAdmin. There are four professional job vacancies at AES. Searches for candidates to fill these positions are in various states of completion. The most difficult position to fill has been that of an Assistant Research Professor of Horticulture. Two national job searches resulted in interviews and job offers but no acceptances. A third national search is underway.

AES research facilities have been improved by the construction of an asphalt road. The road starts at the Research and Technology Center and encircles the aquaculture facility, biotechnology and horticulture field plots, the greenhouse complex, the field work and research building and the farm store. The road includes separate parking areas for farm store visitors, AES employees and field equipment. The road will improve farm store sales and research efficiency, especially during the rainy season. AES research facilities have been improved by the construction of six new polycarbonate greenhouses with a total work space of 7,776 square feet. The new greenhouses replace 20-year old fiberglass greenhouses.

Dr. David Hall was appointed as the fifth President of UVI in August 2009. AES is making an effort to meet with Dr. Hall and provide him with information about the land grant system and the activities of AES researchers in their individual programs. The President will be asked to have meetings with AES faculty and staff, and we will also give him tours of our field and lab facilities.

The work conducted by AES scientists is production oriented. The small size of AES and limited physical and fiscal resources limit our ability to expand into new research areas. One area that we acknowledge being insufficient in is the economic analyses 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 not possible 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.

AES has continued to collaborate with the other insular land grant institutions as a member of the CariPac consortium. The group submits an application to the USDA-NIFA Resident Instruction Grants Program for Institutions of Higher Education in Insular Areas. The funds at UVI are used to support students who conduct research projects in AES labs and present their results at local, regional and national conferences.

The AES Agronomy Program in collaboration with the University of Florida has completed 3 years of research on the USDA-NIFA Integrated Organic Program research grant entitled "Crop Diversification, Complexity and Pest and Beneficial Organism Communities in Humid Tropical and Sub-Tropical Climatic Regimes". This research initiative is a complex multi-system project that examines the effects of legume and grass cover crops, legume and grass cover crop combinations, and crop rotations on insect, weed, nematode, and pathogen communities in tropical organic crop production systems. This project has served as a model for organic crop production, agroecological principles, and sustainable agriculture practices for the U.S. Virgin Islands and the greater Caribbean region. This project has been the focal point of various tours, community functions, and public outreach that has spanned a broad audience that includes school groups, civic organizations, local farmer outreach programming, agriculture researchers and educators, and national agricultural political leaders. This project is the first of its kind in the Caribbean and takes place in conjunction with the Virgin Islands Sustainable Farm Institute which is the first USDA-NOP certified organic farm in the territory. Research from this initiative was presented at the 2009 Caribbean Food Crops Society meetings in the form of a presentation entitled "Effect of Cover Crop Biomass and Green Manure Systems on Vegetable Yield in Low-External-Input (LEI) Organic Crop Production in the Caribbean". Additional results were presented at the National American Society of Agronomy meetings.

The Agronomy Program initiated the Hatch grant "Cover crop and green manure evaluation for integrated cover-crop/livestock systems in the tropics". This research initiative required the procurement and development of two new field

research locations to meet the needs of the grant objectives. The first location is mid-island and consists of approximately 10 acres and is owned by the VI Department of Agriculture and the second location is on the east end of St. Croix which is approximately 20 acres and is owned by Douglas Nelthropp. Both locations were procured under a general use agreement for the Agronomy Program to conduct research and produce hay. Each location required exhaustive preparation in order to prepare the land for cultivation. The land was cleared by bulldozer, root plowed, graded, and disced in preparation for planting. Research operations on the two land parcels began in August of 2009.

In addition, the collaborative SARE grant "Sustainable and profitable control of invasive species by small ruminants" is providing valuable information for the control of invasive plant species utilizing small ruminants as a biological control agent. This year plant samples and data from the on-station studies feeding corral vine (Antigonon leptopus, an invasive ornamental prevalent on most Caribbean islands) to St. Croix hair sheep were analyzed in the lab for nutrient content and digestibility. These results have been disseminated to producers. In addition, the second year of research was concluded for the coral vine pen feeding trial in which intake levels and animal performance were measured for two different coral vine feed rations for cut and carry feeding systems.

The USDA-NIFA-SARE grant "Integrating tropical legumes with condensed tannins into ruminant grass-based diets for sustainable production" in collaboration with Dr. Elide Valencia at the University of Puerto Rico, Mayaguez began over the past year. This research will examine the efficacy of condensed tannin rich tropical legumes on internal parasitism in small ruminants. The primary objective of this research is to determine average daily gain and parasite load of lambs creep grazing condensed tannin containing legumes (Calliandra, Desmodium, and Pigeon Pea). The agronomy program has planted calliandra in de-wormer legume banks for medicinal creep grazing. The de-worming forage bank of calliandra was established over the past year and creep grazing trials will begin in the following year.

The collaborative USDA-CSREES-T-STAR grant with Dr. Phil Kaufman (PI), Assistant Professor in the Entomology and Nematology department at the University of Florida and Dr. Robert Miller, Research Entomologist, USDA, ARS, Cattle Fever Tick Research Laboratory, Edinburg, TX has successfully secured USDA APHIS import permits to export ticks from St. Croix to Texas. This project is entitled "Resistance in the southern cattle tick, *Boophilus microplus*, to acaricides used on St. Croix and Puerto Rico" and seeks to identify pesticide (acaricide) resistance status of the southern cattle tick, Boophilus microplus, a highly capable vector of bovine babesiosis, a highly pathogenic blood parasite of cattle that causes 70-100% mortality. Previously eradicated from Florida, this tick is endemic on many Caribbean islands, including St. Croix, in the US Virgin Islands, and Puerto Rico and its reintroduction to the Southern United States is a continuous threat. The Agronomy Program will be cooperating with Dr. Bethany Bradford, Head of Veterinary Services for the V.I. Department of Agriculture, in *B. microplus* collection. Tick samples will then be preserved and transported to entomology laboratories in Texas and Florida for processing the emergent larvae through their live bioassay protocols for organophosphate, fipronil and ivermectin.

Stuart Weiss participated in the Florida Small Farms and Alternative Enterprises Statewide Conference which was held August 1-2, 2009, with preconference in service training with Dr. John Ikerd on July 31st, and post conference meetings on August 3, 4, and 5 at the University of Florida. The conference was sponsored by the University of Florida, IFAS, and many of the speakers and participants were noted UF Research Faculty. While at the conference Mr. Weiss served as the moderator for the "Whole Farm Pest Management" special session. The speakers for these sessions are leaders in research for subtropical agronomic and vegetable systems and included Dr. Oscar Liburd, Dr. Dan Chellemi, Dr. Robert McSorley, and Dr. Nancy Roe. In addition, Mr. Weiss served as the liaison and host to the conference keynote speaker, Dr. John Ikerd. John Ikerd, Professor Emeritus of Agricultural Economics, University of Missouri, Columbia, hosted the preconference invitation only seminar series entitled "Small Farms are Real Farms" and gave the keynote address. Participants included research faculty, graduate students, county extension faculty and key industry leaders.

Stuart Weiss also participated in the seminar series on grass fed beef entitled "Grass-Fed Beef in Florida: What Is the Potential?" and participated in grass fed beef research and production forums. This research area is of particular interest to the agronomy program because grass fed beef and other pasture based livestock finishing management systems have in the past and are expected in the future to be a growing research area and is of particular interest to Virgin Island livestock production due to concentrate feed limitations. As a result of this conference Mr. Weiss initiated conversations with key UF research faculty that are leading to collaborative grant opportunities with UF research faculty concerning grass-based finishing systems for Senepol beef production here on St. Croix and in Florida. Specifically, Weiss met with Dr. Sally Williams, Associate Professor in the Department of Animal Science, about developing research on the omega 6 vs. omega 3 fatty acid profiles in grass fed vs. conventionally raised feedlot beef.

Stuart Weiss, Acting Agronomy Program Leader continues to pursue a Doctor of Philosophy degree in Horticultural Science with an emphasis in agroecology and organic crop production at the University of Florida Horticulture Department. Mr. Weiss is in the process of compiling dissertation data into publication format for journal submission.

The Animal Science Faculty continued collaboration with a CES colleague at the University of Hawaii to conduct small ruminant workshops in Guam and the Northern Marianas Islands as part of a USDA CSREES grant from the Disadvantaged Farmer/Rancher Program. Using information generated at UVI, training and workshops are being developed to provide assistance to livestock producers in the Pacific Islands.

Two undergraduate students and one graduate student were mentored in the Animal Science Program research lab. One undergraduate was from UVI, one was from Dickinson College (PA) and the graduate student was from Mississippi State, where Dr. Godfrey is an Adjunct Professor and serves on the student's advisory committee. All three students were supported by funds from the Insular Grants Program for Resident Instruction. One of the undergraduate students conducted a research project on evaluating the relationship between hair coat and body temperature in Senepol cows that had been genotyped for the presence of the slick hair gene. This project was conducted as part of a current T-STAR project to evaluate the relationship between hair coat length and color and body temperature in cattle. Artificial insemination was done to produce crossbred calves of varying coat lengths and colors to compare to purebred Senepol. The calves will be born in the Spring of 2010. The other undergraduate and graduate student worked on a project to identify the bacterial microflora present in the reproductive tract of hair sheep ewes. The students worked together to collect samples, conduct cultures in the lab, and process the cultures for further testing.

The Research Analyst managing the sheep research facility left the program in September 2009 to be an elementary school teacher on the island. That position is being advertised with the goal of having it filled by the summer 2010.

Dr. Godfrey was an invited speaker at the International Senepol Symposium held in Medellin, Colombia. Data was presented on the research being conducted on cow productivity and the slick hair gene, as well as a summary of data collected previously on evaluating bull fertility and using thermal imaging to measure body temperature. The symposium had 150 attendees and a sale and livestock exhibit was also part of it.

In June UVI-AES Animal Science Program, UVI-CES Animal Science Program and Annaly Farms co-hosted the annual meeting of the Senepol Cattle Breeders Association on St. Croix. This event was attended by 100 people form the 7 states in the US, VI, Puerto Rico, Venezuela, Colombia, Panama, Brazil, Nicaragua, Dominican Republic and South Africa. There was a tour of the UVI cattle research facility and an auction. Eleven head (6 heifers and 5 bulls) were sold form the UVI herd and included with Annaly Farms cattle (32) shipped to the states in two trailers. As part of the sale agreement with one of the buyers, UVI retained access to some of the semen they will be collecting on the bulls they purchases. This semen will be available for UVI to use in artificial insemination on our herd or for use on the project with UH for the Pacific Islands ranchers.

The AES Aquaculture Program conducted its 11th International Aquaponics and Tilapia Course during June 14-20. This year's course was attended by 56 students from 11 U.S. states (California, Connecticut, Florida, Georgia, Hawaii, Massachusetts, Michigan, Missouri, New Jersey, New York, Ohio), the District of Columbia, St. Croix, St. Thomas, Puerto Rico and 13 other countries (Antigua, Australia, Bulgaria, Canada, Curacao, Denmark, England, Honduras, Jamaica, Mexico, St. Lucia, South Africa, Trinidad and Tobago). Over 11 years the Aquaculture Program has trained 418 students from 42 US states and territories and 47 other countries.

This year marked the 9th year that the Aquaculture Program Leader (Dr. James Rakocy) has written a Question and Answer Column for Aquaponics Journal, a quarterly trade publication with 2,500 subscribers. The advice given is very detailed and has helped the questioners and other interested readers improve their aquaponic systems. Aquaponics Journal is preparing a book containing the 8-years of questions and answers. As a result of increased demand for small-scale aquaponic systems, the consulting arm of Aquaponics Journal fabricates and sells aquaponic systems based on the UVI design. Approximately 27 systems have been sold and the demand is growing. The Aquaculture Program entered into a partnership with this group and is evaluating one of their hobby scale systems, which is meeting its production projections. In turn the Aquaculture Program is using this hobby system as a demonstration in its course.

Dr. Rakocy was invited to speak by the University of Hawaii. He gave two seminars on the UVI aquaponic and biofloc systems at both the UH Manoa Campus and the UH Hilo Campus. He also gave aquaponic and biolfoc presentations as an invited speaker at the Annual Meeting of the Hawaiian Aquaculture Association. Dr. Rakocy was invited to speak at Auburn University where he gave two seminars on the UVI aquaponic and biofloc systems. Dr. Rakocy was invited to participate in a grants meeting of industry and technical committees for the Southern Regional Aquaculture Center (SRAC) and to participate in the SRAC Board of Directors meeting in Memphis, Tennessee.

The Aquaculture Program received two new research grants: a grant (*Evaluating Geotextile Technology to Enhance Sustainability of Agricultural Production Systems in the U.S. Virgin Islands*) for $119,866 over 2 years from the USDA Tropical/Subtropical Agriculture Research Program and a grant (*Alternative Water Treatment Technology for an Aquaponic*

System) for $19,087 from the Water Resources Research Institute.

The AES Aquaculture Program provided research training to two UVI students during its WRRI-funded project titled "Use of Wetland Plants to Manage Nitrate Levels in a Biofloc Fish Production System." The Aquaculture Program sponsored a 3-month internship for a student who took the aquaponics course. During this internship the student was given full control over operating the commercial-scale UVI aquaponics system for the production of tilapia, herbs and vegetables. The student evaluated the production of 26 types of vegetables and herbs.

The Aquaculture Program is providing technical assistance to the Bureau of Corrections, which is constructing two, 50,000-gallon tilapia production systems based the biofloc technology developed at UVI. These tanks have the capacity of producing 30,000 lbs of tilapia annually. Another development is the establishment of a backyard UVI aquaponics system at a local high school. The teacher in charge of this project took the annual aquaponics course and ordered the same backyard system on display at UVI from the company that publishes Aquaponics Journal. This system is capable of producing 1,300 lbs of tilapia and 9,000 heads of lettuce annually.

The Aquaculture Program continued to conduct research on aquaponic and biofloc systems for the production of tilapia. Two biofloc production trials were completed: one in a 50,000-gallon (commercial-scale) tank and one in a very inexpensive 18,500-gallon tank known as a quick tank. An experiment was conducted on cucumber production using dewatered biofloc sludge as an organic fertilizer compared to a slow release inorganic fertilizer. During the 50,000-gallon biolfoc tank production trial, the growth and survival of 13 species of valuable emergent aquatic plants were compared. They were cultured in the denitrification tanks, a component of the system which removes nitrate ions under anaerobic conditions. An experiment was conducted to compare the effectiveness and efficiency of parabolic screen filters versus cylindro-conical clarifiers for removing solid waste from aquaponic systems for the production of tilapia and kankkong (Chinese water spinach).

The Biotechnology and Agroforestry program maintains virus free sweet potatoes in vitro as a source of virus free planting material that can be made available to local farmers and backyard growers. The sweet potato grows rapidly in vitro and studies involving sucrose concentration were evaluated to control the rate of growth. It was expected that high levels of sucrose, that increased the osmotic potential of the medium would provide reduced growth yet healthy strong growth. Levels of sucrose were evaluated including 0%, 3% (standard control), 6%, 8% 9%, 10% or 12%. Later trials involved lower levels of 0%, 0.1%, 0.3% or 1% sucrose.

All sucrose treatment levels supported growth of sweet potato. The 0% resulted in minimal growth or death. The sucrose levels between 6 and 12% had accelerated growth and some shoot tip necrosis after 4 weeks. However side shoots were activated when the shoot tip died. These levels could be used for quick increases of micropropagated sweet potato. Both 0.1 and 0.3% sucrose levels were effective in controlling growth and maintaining the plants in vitro for extended culture time. In vitro sweet potato plants can be maintained at the low sucrose levels for long-term storage and micropropagated at the higher sucrose levels for quick multiplication without the use of plant growth regulators.

A collaboration with a private rice development company resulted in the first successful rice production in the US Virgin Islands. The rice was grown as a winter crop utilizing drip irrigation. The drip irrigation provided sufficient water during growth and production that was comparable to flood irrigation.

Four UVI undergraduates were involved in research projects through independent research. These students focused on in vitro culture of sweet potato and sorrel production from late season planting. Through these student research projects, they learned the importance of replications, data collection, data analysis and data interpretation to draw conclusions. They also followed plant growth and development from juvenility through fruit production and harvest.

The Horticulture program utilized fertigation and chemigation through drip tape, to grow both cucumbers and seedless watermelons. Ten seedless watermelon varieties, which included two yellow and one orange variety in addition to the red type, where grown with a pollinator variety around the field. Seedless watermelons have the potential to be a value-added product for the local and hotel market. Incorporating chemigation into production reduced the labor cost through the reduction of spray application of some pesticides. Watermelon production was severely reduced with limited fruit in the seedless as well as seeded variety. It is thought the increased rainfall during the flowering time influenced fruit set. Another factor was that bees had not been brought in to assist the native population to pollinate the flowers. These factors will be investigated in the next production cycle.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	18.0	0.0
Actual	0.0	0.0	18.0	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Combined External and Internal University External Non-University Panel

2. Brief Explanation

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. Scientists are required to publish their results but sometimes the project is completed before the PI has time to publish the results in a peer reviewed journal, so there is a lag between the project and publications. Because of the small staff size and amount of non-research related work each faculty and staff member end up doing, finding time for writing is difficult for some faculty but we are looking at methods to remedy this, such as collaborating with other institutions to train graduate students and put more emphasis on outputs such as publication in the Faculty Annual Evaluation process.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public

Brief explanation.

The AES Advisory Council meets 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. When needed, 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. One of the high priority issues that has come up is 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.

The newly formed Virgin Islands Farmers Cooperative is taking a different approach to promoting agriculture in the USVI. They are developing plans for small scale crop production and are working with the Horticulture program on this. They are also working with the Agronomy and Animal Science Programs to develop hay production for small livestock production using some of the new, higher quality forages being evaluated.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees

Brief explanation.

AES is available to any individual or group who approaches AES with a question or a proposed research idea. Some of these ideas come through the Advisory Council, whose members are on other community groups or co-ops and bring them forward at the meetings. In some cases AES faculty have to mention that we are here for research and we direct people with questions or concerns about outreach activities to the appropriate Cooperative Extension Service staff.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Other (Clients contact AES with specific requests)

Brief explanation.

Stakeholder input is collected by the pertinent program, depending on the source and area of interest. In many cases stakeholders come to AES faculty and staff with questions or concerns and we can provide an answer in short order. In other cases we are able to get them the information after doing a bit of searching. We are also able to direct them to outside resources such as the VI Deparmentt of Agriculture or other federal agencies or NGOs that may have the information they are seeking.

3. A statement of how the input will be considered

- To Identify Emerging Issues
- Redirect Research Programs

Brief explanation.

Input is used when developing future research projects. In some cases an idea is not really researchable but we make an effort to provide some feedback to the stakeholder on these topics. In other cases where there is a researchable idea brought to us we can incorporate it into current projects or into new projects. Sometimes the lag time between getting an idea and being able to implement the research project to come up with an answer is frustrating to the stakeholders, but when the information is finally generated they are glad to have it.

Brief Explanation of what you learned from your Stakeholders

There is still some confusion about the roles of AES and CES in the eyes of the stakeholders, both internal and external. The local community as well as the central administration of the University are still not clear on the separate functions of AES and CES as part of the land grant system. In many cases stakeholders approach AES about outreach activities and we have to direct them to the CES offices. In addition, there is still pressure from the central administration for AES faculty and staff to conduct outreach activities in spite of there being no joint appointments between AES and CES that would allow us to do these activities.

We also learned that our stakeholders have very specific ideas of what they would like to see AES doing. They provide valuable input on crop varieties that they would like to see evaluated for local production as well as issues relating to minimizing water usage for crop production.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	920199	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	680999	0
Actual Matching	0	0	514386	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	1195385	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from				
Carryover	0	0	0	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Aquaculture - Biofloc Systems

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
307	Animal Management Systems			40%	
403	Waste Disposal, Recycling, and Reuse			60%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.5	0.0
Actual	0.0	0.0	1.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	160048	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	145249	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research project
- Conduct training
- Present data at conferences

- Publish results in scientific journals

2. Brief description of the target audience

The audience for this research consists of local farmers as well as national and international farmers, entrepreneurs, researchers, development workers, teachers, and hobbyists.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	1	
Actual	0	1	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstracts presented at conferences

Year	Target	Actual
2009	1	5

Output #2

Output Measure

- Journal articles

Year	Target	Actual
2009	1	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of new farmers anywhere adopting aquaponic technology

Outcome #1

1. Outcome Measures

Number of new farmers anywhere adopting aquaponic technology

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farmers in the Virgin Islands and elsewhere in the world want to raise tilapia using new intensive biofloc technology that reduces land and water use by 97% and recovers solid and nutrient wastes. The demand for fish is increasing while world fisheries are on the decline. Biofloc technology can play an important role for producing tilapia in tropical regions. The feasibility of this technology has been clearly demonstrated and farmers are interested in adopting it. However, capital costs are a concern for island farmers who have limited resources.

What has been done
A production trial was conducted in a 70 m3 tank known as a quick tank. This tank is very inexpensive and can be erected in 3 hours. It consists of a plastic liner and a 29 m roll of thick gauge vinyl covered hardware cloth. The hardware cloth was unrolled, positioned vertically, formed into a circle and interlocked where the two edges met. As the liner was filled with water, it pressed again the hardware cloth, formed a perfect circle and supported the weight of 70 m3 (18,500 gallons) of water. An aerator, blower, water pump and external clarifier were installed. The 9.1-m (30 ft) diameter tank was stocked with 1,750 Nile tilapia fingerlings, which were fed for 6 months.

Results
The quick tank, which cost $2,200 delivered, produced 1251 kg (2,753 lbs) of tilapia worth $8,258 with 100% survival. Of course this is not profit because the capital cost for aeration, water pumping, solids removal, feed, fingerlings and electricity have yet to be incorporated in enterprise budgets, but the prospects of this system being profitable look very good as the tank and equipment will have a long operating life. Variable costs will mainly cover feed, fingerlings and electricity. Two crops a year will produce more than 2,500 kg (5,500 lbs) of tilapia worth $16,500. The use of the quick tank is a very inexpensive, simple and practical way for low income farmers to start fish culture operations. The solids can be collected and stabilized in lined ponds, dewatered using Geotube technology and used to fertilize field crops and eliminate the need for inorganic fertilizer which was demonstrated in previous research this year. The Virgin Islands Bureau of Corrections is currently building two large (200 m3 each) biofloc tanks capable of producing 13,640 kg (30,000 lbs) per year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

    - During (during program)

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Aquaculture - Aquaponic Systems

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
205	Plant Management Systems			40%	
307	Animal Management Systems			40%	
403	Waste Disposal, Recycling, and Reuse			20%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	2.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	160048	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	145249	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research project
- Provide training
- Present data at conferences

- Publish results in scientific journals

2. Brief description of the target audience

The audience for this research consists of local farmers as well as national and international farmers, entrepreneurs, researchers, extension agents, development workers and teachers.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	1	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstracts presented at conferences

Year	Target	Actual
2009	1	2

Output #2

Output Measure

- Journal articles

Year	Target	Actual

2009	1	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of new farmers anywhere adopting aquaponic technology

Outcome #1

1. Outcome Measures

Number of new farmers anywhere adopting aquaponic technology

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	34

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Interest in aquaponics is expanding rapidly and the scope is global as indicated by the number of people from foreign countries (13) who took the UVI aquaponics course. A former student has been offering aquaponic courses in Hawaii which has led to the development 14 aquaponic farming operations there. A commercial company in Wisconsin, which sells several sizes of the UVI aquaponic system, sold a total of 20 systems this year. These systems are mainly hobby and backyard sized, but several feasibility studies are being conducted for commercial operations.

What has been done
A student from the aquaponics course returned for a 3-month internship at her own expense. She was taught how to operate a commercial aquaponic system, and she evaluated the production of 26 types or varieties of vegetables. An experiment was conducted to evaluate a parabolic screen filter for solids removal compared to the cylindro-conical clarifier used in the UVI system. The objective was to see if there is a solids removal device that works better and uses less space (i.e., a smaller footprint)than the clarifier

Results
After these two devices were operated for 11 weeks in replicated aquaponic systems, there was no difference between treatments for water quality, fish production or the production of Chinese water spinach (Ipomoea aquatica), which is native to Southeast Asia. However, the parabolic screen filter clogged often, which resulted in increased maintenance compared to the clarifier. In commercial systems a parabolic screen filter would be problematic for system management and the current clarifier would be recommended. Spinach production per unit area was 15.2 kg/m2 over the duration of the experiment. Based on this experimental result, the UVI commercial-scale aquaponic system (which occupies 1/8th acre of land) could produce 15,380 kg/yr (33,836 lbs) of spinach, thus making it a good crop for aquaponic systems employing raft culture techniques. This spinach was sold in the AES Farm Store and local consumers accepted it.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

    - During (during program)

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Irrigation

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			30%	
111	Conservation and Efficient Use of Water			30%	
132	Weather and Climate			5%	
205	Plant Management Systems			30%	
405	Drainage and Irrigation Systems and Facilities			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	0.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	3504	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	1775	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research projects
- Present data at conferences
- Publish results in scientific journals

2. Brief description of the target audience

The target audiences are the local crop farmers and back yard growers. These producers normally have less then two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2009
Plan: 0
Actual: {No Data Entered}

Patents listed
{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	{No Data Entered}	{No Data Entered}	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstract presented at conference

Year	Target	Actual
2009	1	1

Output #2

Output Measure

- Research publications

Year	Target	Actual
2009	1	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Knowledge of evapo-transpiration crop coefficients and water use efficiency in crop production
2	Knowledge of water requirements in shade crops production
3	Number of farmers growing shade crops
4	Number of farmers adopting irrigation strategies based on soil moisture

Outcome #1

1. Outcome Measures

Knowledge of evapo-transpiration crop coefficients and water use efficiency in crop production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	2	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water is a limiting resource n the USVI and farmers are interested in ways to minimize water use for crop production and what crops can be grown during the drier times of the year using micro-irrigation.

What has been done
Fourteen varieties of cucumbers were grown to under drip irrigation to determine water use efficiency and production potential in the Virgin Islands. Both slicing and pickling cucumber types were included in the evaluation.

Results
Cucumber production lasted six weeks. Newer varieties of the slicing type outperformed standard varieties presently popular. These varieties had reduced wilting between watering cycles and grew more vigorously indicating a more efficient use of the water applied.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
205	Plant Management Systems
405	Drainage and Irrigation Systems and Facilities

Outcome #2

1. Outcome Measures

Knowledge of water requirements in shade crops production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Virgin Islands farmers and backyard growers because they have limited financial and land resource.

What has been done
No activity project terminated

Results
No resulst because project was terminated.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
205	Plant Management Systems
405	Drainage and Irrigation Systems and Facilities

Outcome #3

1. Outcome Measures

Number of farmers growing shade crops

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual

2009	5	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Virgin Islands farmers and backyard growers because they have limited financial and land resource.

What has been done
No activity project terminated

Results
None because project was terminated

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
205	Plant Management Systems
405	Drainage and Irrigation Systems and Facilities

Outcome #4

1. Outcome Measures

Number of farmers adopting irrigation strategies based on soil moisture

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	2	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Because water is limited in the USVI methods to evaluate usage and demand need to be developed. This will allow farmers to monitor their fields and determine their needs and incorporate that into their budgets.

What has been done
Soil moisture probes were placed within the crop production rows and monitored to determine when water should be applied.

Results
Local farmers were not enthusiastic about using soil moisture probes due to cost and inconvenience.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
205	Plant Management Systems
405	Drainage and Irrigation Systems and Facilities

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- During (during program)

Evaluation Results

Because of the cost of the water monitoring probes and the inconveneince of their use, local farmers were hesitant to invest in them.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Horticulture

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			20%	
133	Pollution Prevention and Mitigation			5%	
202	Plant Genetic Resources			10%	
205	Plant Management Systems			35%	
216	Integrated Pest Management Systems			30%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	1.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	104838	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	68089	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research
- Present data at conferences
- Publish results in scientific journals

2. Brief description of the target audience

The target audiences are the local crop farmers and back yard growers. These producers normally have less then two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2009
Plan: 0
Actual: {No Data Entered}

Patents listed
{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	{No Data Entered}	{No Data Entered}	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Research publications

Year	Target	Actual
2009	1	0

Output #2

Output Measure

- Abstracts presented at conferences

Year	Target	Actual
2009	1	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Selection of pest and disease resistant cultivars and effect of cover crops on soil characteristics
2	Number of farmers using selected cultivars
3	Number of farmers adopting sustainable production systems

Outcome #1

1. Outcome Measures

Selection of pest and disease resistant cultivars and effect of cover crops on soil characteristics

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Virgin Islands farmers and backyard growers with limited financial and land resources need to be provided with crops and methods that minimize external, and expensive, inputs for pest control.

What has been done
Variety trials were conducted on beets a popular root crop in the Virgin Islands which has tolerance to calcareous soils. Beets were established in three planting methods: seeder, hand seeding and transplant. Fourteen varieties were included in the trial involving mainly red, but also red/white, yellow and white rooted varieties. Drip irrigation was used during the field trials.

Results
Hand seeding and transplants provided uniform stand establishment and had less pest infestation. The use of the seeder resulted in varying population densities due to the seed size. The recommended beet seed plate was used. However, there is a great difference in beet seed size between the open pollinated varieties and hybrid seed which tend to be half the size. October and November had high levels of Lepidoptera infestation and pesticide application was required two to three times a week to maintain control of the insect pest. The dense planting from the seeder had greater worm damage due to the greater difficulty in having the pesticide evenly distributed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
202	Plant Genetic Resources
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #2

1. **Outcome Measures**

Number of farmers using selected cultivars

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Number of farmers adopting sustainable production systems

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- During (during program)

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Plant Germplasm Conservation and Enhancement

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
202	Plant Genetic Resources			50%	
205	Plant Management Systems			50%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.5	0.0
Actual	0.0	0.0	1.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	71016	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	40191	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research project
- Sell papaya seeds to local framers
- Present data at conferences
- Develop fact sheets for local growers
- Publish results in scientific journals

2. Brief description of the target audience

The target audiences are the local crop farmers and back yard growers. These producers normally have less then two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	1	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of publications
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of local farmers growing selected plant varieties

Outcome #1

1. Outcome Measures

Number of local farmers growing selected plant varieties

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The target audiences are the local crop farmers and back yard growers. These producers normally have less then two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

What has been done
Sorrel was planted in November to determine the production potential of a late planted. The normal planting time is July to mid September. Twenty varieties were evaluated which included local varieties as well as from the USDA Germplasm Repository. Sorrel plots were established as an on-farm trial.
Eleven virus-free varieties of sweet potato were obtained in vitro from the USDA Germplasm Repository and micropropagated to generate plants for field trials. Sweet potatoes were established in the field at three month intervals.

Results
Late planting of Sorrel in November provided harvest in February through March. This extends the production potential of this crop from the traditional December through January. The late winter production was at a time when demand is great for the product which results in a higher market price for the farmer.
The virus-free sweet potatoes grew vigorously. Two varieties developed excessive vines and minimal tuberization during the summer months. Four varieties had better tuberous root quality than locally grown varieties. The virus-free planting material can be used by farmers and backyard gardeners to increase production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Because the sorrel trials were conducted on a farmer's plot, the farmer was given the opportunity to harvest 2/3 of the crop. The farmer was impressed by the fruit size, color and bearing characteristics of the new varieties which were more productive than locally grown cultivars.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Plant Biotechnology

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms			20%	
204	Plant Product Quality and Utility (Preharvest)			40%	
206	Basic Plant Biology			40%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.5	0.0
Actual	0.0	0.0	1.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	23462	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	11556	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research project
- Develop genetically enhanced plants
- Develop efficient micropropagation systems
- Present data at conferences
- Develop fact sheets for the local population
- Publish results in scientific journals

2. Brief description of the target audience

The target audiences are the local crop farmers and back yard growers. These producers normally have less then two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	1	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of publications
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Abstract

Year	Target	Actual
2009	{No Data Entered}	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of local farmers growing micropropagated pineapple, cassava and hybrid papaya

Outcome #1

1. Outcome Measures

Number of local farmers growing micropropagated pineapple, cassava and hybrid papaya

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	2	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The target audiences are the innovative local crop farmers and back yard growers that try new things to improve their production.

What has been done
Breeding and selection continued toward developing an early bearing, 1kg, sweet and red papaya with disease tolerance. Data was collected on tree characteristics monthly which included height, stem diameter, height to first flower and height to first fruit. Fruit were collected from selected plants for weight, length, diameter, flesh thickness, % brix and color. Seed were isolated from selected fruit cleaned dried and packaged for distribution.

Results
When UVI developed and selected lines were compared to commercial papaya, 90% of the trees in UVI set fruit within three feet of the soil as compared to commercial lines that had only 18%. Fruit size of the UVI lines were twice as large as the Hawaiian cultivars but similar to the fruit size of Caribbean and Taiwanese cultivars. Seeds were made available to farmers and backyard growers. Over 500 packets of papaya seeds were distributed. Papaya results were presented at a regional conference in St. Kitts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
204	Plant Product Quality and Utility (Preharvest)
206	Basic Plant Biology

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Other (Fed certification of transgenics)

Brief Explanation

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- Other (Informal discussions)

Evaluation Results

On site visits to farmers growing UVI papaya lines indicated that they had success and were pleased with the early bearing characteristic and fruit size.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Agronomy - Mixed Cover-Crop Livestock Systems

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
204	Plant Product Quality and Utility (Preharvest)			50%	
205	Plant Management Systems			50%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	2.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	85320	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	50633	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research project
- Present data at conferences
- Publish results in scientific journals
- Conduct local and regional seminars

2. Brief description of the target audience

The target audience consists of local and regional farmers.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	1	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstrcats presented at conferences

Year	Target	Actual
2009	1	1

Output #2

Output Measure

- Articles published in scientific journals

Year	Target	Actual
2009	1	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Outcomes will be measured by the number of local farmers that utilize cover crop technologies in mixed crop-livestock production systems and the number of farmers who use the tested cover crops for soil improvement.

Outcome #1

1. Outcome Measures

Outcomes will be measured by the number of local farmers that utilize cover crop technologies in mixed crop-livestock production systems and the number of farmers who use the tested cover crops for soil improvement.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	2	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small farm holders operating under limited external input farming conditions depend on the production of a diversity of farm products to be sold and consumed on the farm and in the extended family community. This includes agronomic, horticultural, and livestock products that are produced in mixed crop-livestock systems. Cover crops can provide a crucial link between organic farming and livestock production. When planted during fallow periods between main crops, cover crops can improve soil physical, chemical, and biological properties and consequently lead to improved soil health and yield of principal crops. Livestock incorporation can provide valuable additional revenue to small holder farmers and can serve as a primary source of organic fertilizer through added manure production. This will result in closed system nutrient cycling where the farm is recycling nutrients from cover crop to livestock to cash crop. Therefore, cover crops may be able to serve to build and improve soils for cash crop production, as well as provide forage in the form of principle grazing, stored hay, cut and carry forage, or green chop for livestock production.

What has been done
Two experiments were initiated and established in August and September, 2009. Sorghum sudan (var. mega mill), crotalaria juncea, lablab purpureus (cv. Rio Verde), and mixtures of both sorghum sudan/lablab and sorghum sudan/crotalaria were planted at two different farming locations on St. Croix, US Virgin Islands. Comparisons were made between crops and weedy fallows for vegetative, root, and total biomass production based upon three different harvest dates. Plant tissue samples were collected for plant tissue nutrient analysis and soil samples were collected to determine any soil nutrient shifts as a result of main treatment effects.

Results
Research results are currently being assimilated and analyzed, but no results were determined in 2009.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Animal Science - Beef Cattle

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals			10%	
305	Animal Physiological Processes			10%	
306	Environmental Stress in Animals			60%	
307	Animal Management Systems			20%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	2.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	24698	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	12508	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

•Conduct research •Publish results •Present data at conferences •Collaborate with other members of multistate project

2. Brief description of the target audience

Beef prodcuers in the tropics, greater Caribbean, Central and South America and the southern US.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstracts

Year	Target	Actual
2009	1	1

Output #2

Output Measure

- Journal articles

Year	Target	Actual
2009	0	0

Output #3

Output Measure

- Invited presentations

Year	Target	Actual
2009	{No Data Entered}	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of cattle producers using managed breeding program
2	Number of cattle producers incorporating temperament into their selection criteria

Outcome #1

1. Outcome Measures

Number of cattle producers using managed breeding program

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	2	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Livestock production in the USVI is impacted by seasonal rainfall and forage availability. Comparing cow and calf production traits and cow reproduction at different times of the year will result in data that can be used to make recommendations to local producers about herd management.

What has been done
Cow productivity was monitored for two years and compared between a Spring calving and Fall calving herd. After weanng calves grazed forgae pastures with no supplemental feed. Records collected an anlayzed included pregnancy rate, cow body weight and condition score at breeding, calving and weaning and calf weights at birth, weaning and yearling.

Results
Cows that calved in the Fall were larger (frame score), heavier and had higher body condition scores than Spring calving cows. The calves born during the Fall had higher birth weights, lower weaning weights and higher yearling weights than Spring born calves. Fall born calves had higher temperament scores at weaning but not as yearlings compared to Spring born calves. Growth differences of cows and calves may be due to seasonal forage availability, rainy season or sire effect.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
306	Environmental Stress in Animals
307	Animal Management Systems

Outcome #2

1. Outcome Measures

Number of cattle producers incorporating temperament into their selection criteria

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Other ()

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Animal Science - Small Ruminants

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals			40%	
303	Genetic Improvement of Animals			10%	
307	Animal Management Systems			50%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	2.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	48065	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	39136	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

•Conduct Research Experiments •Publish results •Present data at conferences

2. Brief description of the target audience

The target audience is hair sheep producers in the tropics and the southern US.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstracts presented at conferences

Year	Target	Actual
2009	1	1

Output #2

Output Measure

- Journal articles

Year	Target	Actual
2009	0	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of local farmers using crossbred sheep

Outcome #1

1. Outcome Measures

Number of local farmers using crossbred sheep

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	10	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Local sheep producers want to increase the size and efficiency of lambs produced without increasing costs.

What has been done
During a fall and summer lambing, St. Croix White and Dorper X St. Croix White lambs were weaned at either the standard 63 days of age or 90 days of age in an accelerated lambing system, in which ewes produce 3 lambs crops every 2 years. Lambs were placed on pasture with feed supplementation after weaning. Ewe milk production was evaluated throughout teh enitre 90-d period.

Results
Ewe weight at breeding prior to the first lambing was the same as at the subsequent breeding (40.9 vs 41.9 kg, respectively). At the start of the subsequent breeding 43% of LATE and 10% of CTRL ewes were nursing lambs. Pregnancy rate at the subsequent breeding, determined by ultrasound, was not different between LATE and CTRL ewes (97.4 vs. 97.8%, respectively). At weaning LATE lambs were heavier than CTRL lambs (14.5 vs kg, respectively). There was no breed x weaning age interaction. At 90 d of age LATE and CTRL lambs had similar weights (14.5 vs 13.9 kg, respectively). Milk production on d 63 was not different between breed or weaning age but by d 76 and 90 milk production of LATE ewes had decreased to 84 and 66% of d 28 levels. Weaning at 90 d of age can be done in an accelerated lambing system with no detrimental effect on ewe productivity. Late weaning led to a decrease in the amount of time that lambs received high cost, imported feed without a reduction in their growth. There is potential to have a positive impact on the economics of producing hair sheep in the tropics.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

Departure of a resercah assistant has led to a delay in conintuing thsi project until that position is fulled. Data that still needs to be collected incudes using 120 d of age as a weaning date.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Other (Informal discussions)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Animal Science - Dairy Cattle

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
305	Animal Physiological Processes			100%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.5	0.0
Actual	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

This program was terminated due to the termination of multi-state research Project S-1023

2. Brief description of the target audience

There is no target for this project because it was terminated.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstracts presented

Year	Target	Actual
2009	1	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of collaboratrs on the project using coat color in their study design

Outcome #1

1. Outcome Measures

Number of collaboratrs on the project using coat color in their study design

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	6	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Other (Interview with farmers)

Evaluation Results

Key Items of Evaluation