2011 University of the Virgin Islands Research Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 05/07/2012

I. Report Overview

1. Executive Summary

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 way of addressing this issue is developing collaborations with other departments and institutions. AES has continued to collaborate with the other insular land grant institutions to obtain funds for student support in AES labs. The Resident Instruction 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 Agronomy program received two new grants. One was an On-Farm research grant from the Southern SARE Program in collaboration with the Horticulure program to evaluate cover crop mulch systems for minimum till crop production in the U.S. Virgin Islands. The second grant was from the USDA Southeastern Sun Grant Program and will evaluate the sustainability of integrated biofuel feedstock production systems in the southeast and is a collaborative project with the University of Tennessee.

In Agroforestry focus centered on seed collection, germination and phenology of rare native trees in the US Virgin Islands. Plant species native to the USVI tend to tolerate drought better than the showy and exotic ornamental plants people like to use for landscape plantings. The objectives of this study were: assess drought tolerance, determine growth rates, and calculate the amount of water necessary to produce plants of a size suitable for landscape planting, for three native tree species. This information can be used by local nurseries to grow trees native to this climate and reduce the import of exotic tree species.

The Animal Science Faculty continued collaboration with CES colleagues at the University of Hawaii to conduct livestock production workshops in Guam and the Northern Marianas Islands as part of a USDA Office of Advocacy and Outreach grant (Outreach and Assistance in Tropical Pasture and Livestock Management for Pacific Islanders). Using information generated at UVI cattle producers in the Marianas Islands were trained in artificial insemination using Senepol semen to increase the genetic diversity of their cattle herds. Calves will be born in Spring 2012. An extension to the current grant was funded through the Office of Outreach and Assistance to expand the work to Palau and Pohnpei and continue work in the Northern Marianas Islands.

Two undergraduate students were mentored in the Animal Science program research lab with support from the Insular Grants Program for Resident Instruction. The students conducted work that was part of an ongoing USDA-NIFA TSTAR project and a multistate research projects (W-1173). The TSTAR project is evaluating the evapotranspiration (sweating rates) of heat tolerant Senepol cattle in collaboration with U of Hawaii, University of Arizona and Cornell University as part of a multistate research project (W-1173). Cattle were evaluated during the summer of 2011 and compared across genotype using crossbred heifers produced as part of a previous TSTAR grant.

The Aquaculture program conducted its 13th International Aquaponics and Tilapia Course during March 14 - 17, 2011. This year's course was attended by 55 students from 12 U.S. states (California, Colorado, Connecticut, Florida, Georgia, Kentucky, Maryland, North Carolina, New York, Pennsylvania,

Texas, Virginia), the District of Colombia, St. Croix, Puerto Rico and 12 other countries (Barbados, BWI, Canada, Egypt, England, Grenada, Hong Kong, Jamaica, Netherlands Antilles, South Africa, Trinidad and Tobago). The program also offered a 2-day workshop on September 1 - 2, 2011 with 10 participants with projects in the Caribbean region (Anguilla BWI, Tortola BVI, Puerto Rico, Haiti, and Trinidad and Tobago). Over 11 years the Aquaculture Program has trained 565 students from 42 US states and territories and 55 other countries.

The Aquaculture program mentored one student who was supported by funds from the Insular Grants Program for Resident Instruction. This student collected demographic data on customers at the UVI Farm Products Store and analyzed their preference for cucumber varieties and the characteristics most important to them.

Following the resignation of a Research Specialist in 2010 and retirement of the Research Faculty in early 2011, the program was supported in early 2011by a Research Specialist and a Research Analyst. The Research Analyst resigned in July, 2011 and the program continued under the supervision of the Research Specialist.

The Biotechnology & Agroforestry program was awarded grants from the USGS-WRRI, USDA-SCG, two from the USDA-SCBG and one from a private source. These grants include collaboration with UVI-CES, the VI Department of Agriculture, local farmers, USDA, University of Florida-IFAS, Ventria Biosciences and Pan American Seeds to work on reducing challenges to local farmers involving crop production and food security.

During the year, five UVI undergraduate students conducted independent research projects in the Biotechnology & Agroforestry program. The projects involved seed germination of a federally endangered tree species, Hibiscus sabdariffa for evaluation between reciprocal crosses, to develop F1 hybrids, between Caribbean varieties and lines from Africa and fruit quality for anthocyanin content. Students presented the results of their research at local, national and international symposia.

Fourteen sorrel cultivars obtained from the USDA Germplasm Repository and locally in the Caribbean have been evaluated at the University of the Virgin Islands. The purpose of this research was to determine the concentration of the red anthocyanin pigment in the calyxes from fourteen sorrel cultivars and use paper chromatography to resolve the pigments.

A trial was set up to monitor weevil populations during sweet potato production. Pheromone bait was used to attract the weevils to monitor the population over time. The weevil population increased during the first four weeks and stabilized through the thirteenth week. Weevil damage to the sweet potato leaves was visible by the third week. From this initial trial, 'Beauregard-14', 'Bonita', 'Evangeline' and 'Liberty' have production potential for the US Virgin Islands.

The Horticulture Research Faculty position has been filled as of July 2011. Shortly after arriving at UVI the new faculty member met with stakeholders (farmers and CES) in St. Croix and in St. Thomas and discussed research needs in vegetables in the U.S. Virgin Islands.

A grant was submitted to USGS-WRRI on the use of microirrigation for sustainable vegetable production. The objectives are to develop and evaluate improved water management practices using microirrigation in selected vegetables, evaluate the effect of varying rates of irrigation on the yield and growth of selected vegetables and determine minimum water requirements. A second research proposal was submitted to Southern Sustainable Agriculture Research and Education (SSARE) to field test and evaluate neem, a plant based pesticide for reducing pest incidence, which farmers could easily adopt to support sustainable vegetable production. A grant was submitted to Southern SARE in collaboration with the Agronomy program to evaluate and compare five tropical cover crop/green manure species to a weedy

fallow in rotation with a subsequent minimum-till hot pepper (Capsicum spp.) rotation where the cover crop/green manure residue is mechanically (roller-crimper) killed for surface sheet mulch for weed suppression and to improve soil quality. A research plan was submitted to private company (Diageo Inc.) in the US Virgin Islands to conduct greenhouse trials of leafy greens using their rum distillery production waste to evaluate growth, yield response and to determine the nutritional and chemical contents of leafy green samples grown in the greenhouse.

One undergraduate student was mentored in the Horticulture program research program. One graduate student from a stateside institution requested to conduct research for her Master's degree (Biology) dissertation. The UVI student was supported by funds from the Insular Grants Program for Resident Instruction. The students conducted work that was part of a Multistate research project (W-2128) on sustainable water use for vegetable production.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	13.0	0.0
Actual	0.0	0.0	10.5	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.

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.

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 Department 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.

Because of some budgertary constraints we are evaluating existing research programs and making descisons about them. We have received a lot of input from stakeholders in support of our exisiting programs and we will use that to make informed decisions about the programs in AES.

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	1049253	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	560410	0
Actual Matching	0	0	348595	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	909005	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	41473	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Aquaculture - Biofloc Systems
2	Aquaculture - Aquaponic Systems
3	Animal Science - Small Ruminants
4	Animal Science - Beef Cattle
5	Plant Biotechnology
6	Plant Germplasm Conservation and Enhancement
7	Horticulture
8	Irrigation
9	Agronomy - Mixed Cover-Crop Livestock Systems

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			60%	
403	Waste Disposal, Recycling, and Reuse			40%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual Paid Professional	0.0	0.0	1.0	0.0
Actual Volunteer	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	91444	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	45630	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
- 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, extension agents, development workers and teachers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

<u>Output #1</u>

Output Measure

- Abstracts presented at conferences
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Journal articles
  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 new farmers anywhere adopting biofloc technology

Outcome #1

1. **Outcome Measures**

Number of new farmers anywhere adopting biofloc technology

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
- Other (Changes in staffing within research program)

Brief Explanation

The research faculty retired and two research assistants in the program left UVI to pursue graduate degrees at stateside universities. This portion of the program is being phased out so that the focus can be on the aquaponics system in upcoming years.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

N/A

Key Items of Evaluation

N/A

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			30%	
307	Animal Management Systems			35%	
403	Waste Disposal, Recycling, and Reuse			35%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual Paid Professional	0.0	0.0	1.5	0.0
Actual Volunteer	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	91444	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	45631	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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

<u>Output #1</u>

Output Measure

- Abstracts presented at conferences

Year	Actual
2011	3

Output #2

Output Measure

- Journal articles

Year	Actual
2011	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	Actual
2011	1

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 who took the UVI aquaponics course (65). A former student began an aquaponic farm in Richmond, Ca using UVI Aquaponic System technology

What has been done
Production of cucumbers was evaluated in the aquaponic system. Ten varieties of cucumbers were produced at two different densities. Data was collected on yield number and biomass produced per square meter. Market preference was also evaluated for shape, length and color.

Results
Yield by density was mixed. There was considerable variation in yield per square meter. Planting density of 8.0 per meter square is equivalent to commercial field production densities. The variety ?Sweeter Yet? yielded 24 fruits (6.013 kg) per square meter per crop or 44.7 kg/m^2 annually. The variety ?Palace King? yielded 6.161 kg per square meter per crop but only 18 fruits.

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

Hurricanes and power outages can do damage to the facilties and aquaponic systems in place.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The research information is used to support training of people interested in aquaponics. Producers who receive the training then utilize what they learn in their own operations on a variety of scales from commercial to back yard systems.

Key Items of Evaluation

Poeple come from all over the world to receive the research-based training.

V(A). Planned Program (Summary)

Program # 3

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 FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	1.0	0.0
Actual Volunteer	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	37502	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	29172	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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstracts presented at conferences

Year	Actual
2011	2

Output #2

Output Measure

- Journal articles

Year	Actual
2011	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of local farmers weaning sheep at 90 days of age

Outcome #1

1. Outcome Measures

Number of local farmers weaning sheep at 90 days of age

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	3

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
St. Croix White ewes and lambs, and Dorper x St Croix White ewes and lambs were used. Lambs were weaned at 63 or 120 d of age based on breed, sex and litter size. After weaning lambs were fed concentrate ration and grazed guinea grass. Ewes grazed guinea grass at all times. Weights were analyzed using breed and weaning age as main effects. Pregnancy was determined after a 35-d breeding season using transrectal ultrasonography.

Results
The results of this study show that weaning lambs at 120 days of age can be done in an accelerated lambing system with no detrimental effect on ewe productivity or lamb growth. Ewe weight at breeding prior to the first lambing was the same as at the subsequent breeding regardless of weaning age (42 kg). At the start of the subsequent breeding all of the late weaned ewes and none of the control ewes were nursing lambs. Days to first heat in the breeding season was not different between late and control ewes (16 vs. 14 days, respectively). Lambing rate after the subsequent breeding was not different between late weaned and control ewes and CTRL ewes (72 and 75 percent, respectively). At weaning late weaned lambs were heavier than control lambs (20 vs. 12 kg, respectively). Weaning at 120 days of age can be done in an accelerated lambing system with no detrimental effect on ewe productivity. The later weaning age decreases the amount of time that lambs received high cost, imported feed without a reduction in their growth and would have a positive impact on the economics of producing hair sheep in the tropics (savings of $13 per lamb).

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.)
- Other (Parasites)

Brief Explanation

Heavy rains made parasites an issue with the lambs during part of the year.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Based on stakeholder feedback, anything that reduces the use of expensive, imported feed for livestock is viewed favorably.

Key Items of Evaluation

The ability of the producer to save $13/lamb in feed costs by weaning at 120 days compared to weaning at 63 days.

V(A). Planned Program (Summary)

Program # 4

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 FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual Paid Professional	0.0	0.0	2.0	0.0
Actual Volunteer	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	66513	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	37573	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 producers in the tropics, greater Caribbean, Central and South America and the southern US.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Year: 2011
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstracts

Year **Actual**

2011	1

Output #2

Output Measure

- Journal articles

Year	Actual
2011	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

Number of cattle producers in the VI using managed breeding program

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

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 four years and compared between a Spring calving and Fall calving herd. Records included body weight and condition score at breeding, calving and weaning and calf weaning weights.

Results
Cows that calved in the Fall (n = 101) were heavier, taller and had higher body condition scores than Spring calving cows (n = 245) at weaning. At calving the Fall calving cows were heavier than Spring calving cows. At breeding cows that calved in the Fall were heavier and had higher body condition scores than cows that calved in the spring. Calf weaning weight was higher for Spring born calves than it was for Fall born claves. This resulted in cows that calved in the Spring having a higher efficiency, measured as the ratio of calf weaning weight to cow body weight at weaning, than cows calving in the Fall. Even though the Fall calving cows were larger they did not wean as heavy calves as the Spring calving cows did.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
305	Animal Physiological Processes

307 Animal Management Systems

Outcome #2

1. **Outcome Measures**

Number of cattle producers in the VI incorporating temperament into their selection criteria

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
- Other (Culling within the herd)

Brief Explanation

Heavy culling has decreased herd size but it is being built up again.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The results show that cows calving in the spring are more efficent which is somthing that stakeholders are interested in improving.

Key Items of Evaluation

- Calf weaning weight was higher for Spring born calves
- Cows that calved in the Spring having a higher efficiency, measured as the ratio of calf weaning weight to cow body weight at weaning

V(A). Planned Program (Summary)

Program # 5

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			40%	
204	Plant Product Quality and Utility (Preharvest)			30%	
206	Basic Plant Biology			30%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	1.0	0.0
Actual Volunteer	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	29490	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	14475	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 through plant breeding
- Develop efficient micro-propagation 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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

<u>Output #1</u>

Output Measure

- Number of publications

Year	Actual
2011	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of local farmers growing micro-propagated sweet potato, cassava and hybrid papaya

Outcome #1

1. Outcome Measures

Number of local farmers growing micro-propagated sweet potato, cassava and hybrid papaya

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Stakeholders growing sweet potato noticed deformed leaves and a decline in production over time. Farmers wanted to produce pineapple out of season to extend the market and better time the crop. If a farmer misses the natural flowering, they need to wait a year for the next natural cycle.

What has been done
A survey was conducted with local farmers on the practices for propagating sweet potatoes and their source of planting material. Leaf samples were collected from multiple sweet potato plants from each farm and evaluated in the lab for viruses using ELISA kits. Virus-free sweet potatoes were maintained and micropropagated in vitro. Twenty virus-free sweet potatoes from tissue culture were acclimatized in the greenhouse and established in field plots. Micropropagated pineapple were acclimatized to the greenhouse and grown in pots. At the 35 leaf stage, pineapples were induced to flower with 0, 1 or 2 applications of NAA. The NAA applications were spaced three weeks apart. Data was collected on floral initiation and time to harvest.

Results
All farmers had multiple viruses in their sweet potato stock used for production. Propagation of these infected lines by growers maintains the virus in the plant that weakens them under adverse conditions. The use of virus-free sweet potatoes had a 24% increase in production in marketable tuberous roots over virally infected varieties. However, after one season in the field, 21% of the originally virus-free sweet potatoes had at least one virus. This indicates a need to maintain virus-free sweet potatoes in vitro and grow cutting of the virus-free varieties for farmers in an antivirus screen house. No pineapple flowered without an NAA application out of season. A single application of NAA resulted in 80% floral induction while two applications of NAA increased floral induction to 96%. These results allow growers to apply NAA in the late winter and spring if their plants did not induce flowers under normal conditions. A summer and fall pineapple crop

can be obtained extending the fruiting season.

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

Rainfall was well above normal which compromised field planting. When planting did occur, field preparations were conducted under wet conditions resulting in clumpy soil. Excessive rainfall delayed access to the field for weed control. The passing of a hurricane tore open the screen the length of the antivirus screen house used to maintain clean sweet potato stocks.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Stakeholders were surprised at the level of virus in there sweet potato plants. They made requests and were given virus-free sweet potato cutting to grow in their plots. Pineapple growers were eager to learn more on the induction of flowering out of season. They were amazed of the small effort required to induce flowering of pineapple out of season.

Key Items of Evaluation

Acceptance of the use of virus-free sweet potatoes by local growers to increase marketable yield. Pineapple production outside the normal spring season.

V(A). Planned Program (Summary)

Program # 6

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			70%	
205	Plant Management Systems			30%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	1.0	0.0
Actual Volunteer	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	55524	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	61509	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 than two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

<u>Output #1</u>

Output Measure

- Number of publications

Year	Actual
2011	3

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 Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Sorrel (Hibiscus sabdariffa) is limited to the Christmas holiday season even though the demand for sorrel is year round. Growers save seed each year since seed is not commercially available. Caribbean Sorrel varieties are sensitive to high pH calcareous soils resulting in chlorotic leaves, which hinders growth and production.

What has been done
Sorrel, obtained from the Caribbean region as well as from the USDA Germplasm Repository, were planted in both calcareous soils (pH 8.5) and neutral noncalcareous soils (pH 7.0) at a 2 ft in-row spacing. Plant height, branching, flower induction and tolerance to the calcareous soils were recorded. A rating system from 1-5 was developed based on the level of chlorosis and necrosis observed in the sorrel leaves.

Results
The Caribbean varieties of sorrel were all sensitive to the calcareous soils. The white varieties not only were chlorotic but also developed necrotic areas along the leaf margins. The Caribbean varieties were shorter, had fewer branches and reduced flowering and fruit production as compared to the African lines. The African lines evaluated had limited interveinal chlorosis and were productive. On the pH 7 soil, all the sorrel was healthy green without a trace of chlorosis. The day neutral sorrel grew and was productive year round. However, production during the three months with the longest photoperiod resulted in a third of the production obtained the rest of the year. Both the fruit set and size of the fruit is reduced during the summer making it not economically feasible to grow during late spring and early summer.

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.)

Brief Explanation

Excessive rain throughout the year delayed access to field plots. Planting material started in the greenhouse became overgrown due to delayed field preparations during the fall.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Farmers have grown the day neutral sorrel released by the University of the Virgin Islands and the fruits were commercially available for the first time in early October, two month ahead of the normal season. Farmers were able to sell all the sorrel produced and could initiate a second planting for harvest from March to May with the day neutral variety. Incorporating the day neutral sorrel with the traditional sorrel varieties increases the sorrel season from three to eight months.

Key Items of Evaluation

Stakeholders are growing the new varieties of sorrel.

V(A). Planned Program (Summary)

Program # 7

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			25%	
202	Plant Genetic Resources			35%	
205	Plant Management Systems			30%	
216	Integrated Pest Management Systems			10%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	1.0	0.0
Actual Volunteer	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	71718	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	23906	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 th0n two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

<u>Output #1</u>

Output Measure

- Research publications
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Abstracts presented at conferences
  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	Selection of pest and disease resistant cultivars

Outcome #1

1. Outcome Measures

Selection of pest and disease resistant cultivars

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Beet, melon, cabbage and tomato are vegetable crops in high demand but seldom grown resulting in high priced imports. Varieties needed to be evaluated to recommend those most appropriate for the Virgin Islands. Beets are a multi-use plant that has usable leaves as greens and tuberous roots. Cabbages have early, mid and late season types and no type is recommended for the Virgin Islands to assist farmers in which is the most productive to grow. Tomatoes is heat sensitive crop and pests are issue in melons and peppers.

What has been done
Variety trials were continued in 2011 with 16 varieties of beets. Beside the standard solid red beet, novel varieties were evaluated which included, yellow, white, red/white striped and elongated roots as well as green, red/green and solid red tops. Single row was compared with double row planting. Direct seed and transplants were evaluated. A variety trial continued utilizing 15 cabbage varieties, five for each early, midseason and late, were grown in a replicated trial. A variety trial on melons and tomatoes conducted in replicated plots utilizing 13 and 4 varieties respectively. Twenty varieties of peppers planted in replicated field plots in late fall season. Currently, trial is ongoing.

Results
All beets did well in the high pH calcareous soils throughout the year. Aphids were only a problem during early spring. The double row beet system was more efficient than the single row. The novelty of the nonsolid red beets had a higher marketable value though the production cost were similar. Consumer preference was for the solid red or the red/green beet tops which were used in salad or steamed. Beets could be grown year round if irrigation is available during the dry season. Cabbage can be a productive crop if it is closely monitored to control diamond back moth. A regular integrated pest control results in well formed heads. The early cabbage types didn?t form adequate heads that were solid. The midseason varieties out preformed the other

two types. In case of melons, frequent rainfall during the late growing and harvest period affected quality production for melons. Trials in tomatoes and peppers are ongoing and data collection is in progress.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

Excessive rain and flooding delayed the fall tomato planting and harvest and the quality of melons.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Stakeholders were skeptical of the quality of melon fruits due to excessive rain and weather conditions.

Key Items of Evaluation

Marketability of fruits and taste of melons.

V(A). Planned Program (Summary)

Program # 8

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			15%	
111	Conservation and Efficient Use of Water			25%	
132	Weather and Climate			15%	
205	Plant Management Systems			20%	
405	Drainage and Irrigation Systems and Facilities			25%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	1.0	0.0
Actual Volunteer	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	32472	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	34451	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 than two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstract presented at conference

Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Research 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 farmers adopting irrigation strategies based on soil moisture
2	Knowledge of fertigation and chemigation use in vegetable crop production

Outcome #1

1. Outcome Measures

Number of farmers adopting irrigation strategies based on soil moisture

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water is a rare commodity on a semiarid island and the Virgin Islands stakeholders are concerned to use this precious resource as efficiently as possible. Fertigation and chemigation are new technologies for utilizing a drip irrigation system to apply fertilizer and pesticides.

What has been done
Fifteen varieties of honeydew melons were started in seedling tray and planted into replicated field plots of 3 rows of fifteen plants per row at two foot in row spacing. Microirrigation was used to supple both fertilizer and insecticide. Plots were maintained to control weeds.

Results
Only six varieties produced fruits. Rest of the varieties didn?t produced marketable fruits due to frequent rainfall and insect pests damage. Trial needs to be repeated in order to collect data and results.

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 fertigation and chemigation use in vegetable crop production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water is a precious commodity on a semiarid island and the Virgin Islands stakeholders are concerned to use this rare resource as efficiently as possible. Fertigation and chemigation are new technologies for utilizing a drip irrigation system to apply fertilizer and pesticides. In the Virgin Island there is no dormant period for pest. Pest management is a constant battle. For the cucurbits the melon worm, army worm and leaf minors are constant.

What has been done
Two crops of cucumbers were planted one with thirteen varieties the first trial and the following trial there were nine varieties. In the first trial we wanted to see if there would be a difference in yield between the same varieties grown at two foot spacing and one foot spacing, information pending. In the first month of planting the seedling we injected 10-55-10 at 25lbs every two to three weeks. Once the seedlings were established one cup of Keyplex along with 20-20-20 was injected once a month or as the need arose.

Results
Injecting Malathion, Sevin or Venom on a rotation as needed once the pest reaches levels were they can no longer be controlled using topical application, often bring the situation under control. Though using drip irrigation has been very beneficial for us it has not been easy to get. Through our regional supplier we have only been able to get 8ml and 10 ml low flow drip tape, the 15ml is very difficult to obtain and generally has to be ordered from Hummert international which can be very pricy once shipping to the Virgin Islands is added.

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.)

Brief Explanation

None reported during this time period.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Stakeholders continued to see and gathered information on the fertigation and chemigation system. High cost in the beginning is concern though water and fertilizer management is more efficient.

Key Items of Evaluation

None at this time.

V(A). Planned Program (Summary)

Program # 9

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
101	Appraisal of Soil Resources			20%	
204	Plant Product Quality and Utility (Preharvest)			30%	
205	Plant Management Systems			30%	
302	Nutrient Utilization in Animals			10%	
307	Animal Management Systems			10%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual Paid Professional	0.0	0.0	1.0	0.0
Actual Volunteer	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	84303	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	56248	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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstracts presented at conferences

Year	Actual
2011	1

Output #2

Output Measure

- Articles published in scientific journals

Year	Actual
2011	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 and as livestock forage.

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 and as livestock forage.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	3

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.
There is a high demand for Crotalaria juncea seed in the United States of America for use as a cover crop yet there are limited seed supplies available to farmers for planting and 98% of C. juncea seed is imported. This could become a viable cash crop for Virgin Island farmers. Research needs to be conducted to determine if C. juncea can be grown as a cover crop, forage crop, and for seed production.

What has been done
Due to the limited availability of commercial C. juncea seed in the U.S., research trials were initiated in 2011 to investigate C. juncea cv IAC-1 as a cover crop, for livestock forage production, and for commercial seed production under low-external-input farming conditions. A feasibility study was conducted on St. Croix in the U.S. Virgin Islands to test two seed production systems. Test plots were broadcast seeded and then rolled with a culti-packer. No inputs were applied for

the production of the crop. The first system (SYS1) measured seed production at 2 harvest dates (160 days after planting (DAP) and 191 DAP). The second system (SYS2) combined biomass removal through a hay harvest 55 DAP and then seed harvest on the C. juncea re-growth at 195 DAP or 140 days after forage removal.

Results

SYS2 produced a mean biomass yield of 4,741 kg/ha of forage on a dry matter basis which was dried, bailed for hay, and subsequently fed to sheep in a separate feeding trial. Preliminary results indicate that SYS2 produced fewer seed pods per plant (21 ±2.8, $p<0.05$)) and had fewer seeds per pod (4.7 ± 0.2, $p<0.0001$)) than either harvest 1 (30 ±2.5 and 6.6 ±0.2, respectively) or harvest 2 (29 ±2.5 and 6.4 ±0.2, respectively) from SYS1. At the time of seed harvest, SYS2 had higher plant density with 67 plants /m2 than harvest 1 (160 DAP) or 2 (191 DAP) from SYS1 with 40 and 41 plants/m2, respectively ($p<0.0001$). Total seed yield was highest in harvest 1 of SYS1 producing 3,153 kg/ha ±270 which was statistically similar with harvest 2 that produced 3,115 kg/ha of seed from SYS1, but was greater than the seed harvest in SYS2 with 1,040 kg/ha of seed ($p<0.0001$). Results of this study indicate that Crotalaria juncea cv. IAC-1 can be grown in the tropics under low-external-input conditions to produce a robust seed crop, and that farmers can harvest C. juncea forage for livestock production and still produce and harvest a seed crop for future planting or for sale as a potential cash crop. Additional research trials will follow to further investigate the use of C. juncea as a multi-purpose crop in low-external-input mixed crop/livestock systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
302	Nutrient Utilization in Animals
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Other (Feral livestock depredations)

Brief Explanation

Feral cattle have been grazing the plots as they have been planted. Efforts to capture/remove these animals has met with limited success.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Because of the predation on the crops it was difficult to evaluate the outcomes of the project.

Key Items of Evaluation

- lowering the reliance and use on chemical inputs
- increasing yields, increasing biodiversity
- minimizing production costs
- increasing agroecological system sustainability