2007 University of the Virgin Islands Research Plan of Work

Brief Summary about Plan of Work

The Agricultural Experiment Station (AES) is located on the St. Croix Campus of the University of the Virgin Islands. AES is part of the Research and Public Service Component. The U.S. Virgin Islands are semiarid, subtropical islands in the Lesser Antilles. The islands are marked by easterly trade winds which provide a nearly constant breeze and alternating periods of drought and heavy rain. A long tradition of agriculture in St. Croix provides an ideal location for our research mission. AES conducts basic and applied research to meet the needs of the local agricultural community in increasing production, improving efficiency, developing new enterprises, preserving and propagating germplasm unique to the Virgin Islands, and protecting the natural resource base. AES has research programs in animal science aquaculture, biotechnology, forage agronomy, fruit and ornamental crops and vegetable crops. Our vision is to generate information by conducting scientific research that leads to improved agricultural practices in the Virgin Islands and the Caribbean Region. Our research programs will be increasingly influenced by the needs of the public and the farming community and by research conducted by other agricultural research institutions Using new technologies, the results of our research will be disseminated more widely to farmers and the international scientific community.

Estimated number of professional FTEs/SYs to be budgeted for this plan.

Year	Extenion		Research	
	1862	1890	1862	1890
2007	0.0	0.0	15.5	0.0
2008	0.0	0.0	11.5	0.0
2009	0.0	0.0	11.5	0.0
2010	0.0	0.0	9.5	0.0
2011	0.0	0.0	6.5	0.0

Merit Review Process

The merit review process that will be employed during the 5-Year Plan of Work cycle

- Combined External and Internal University External Non-University Panel

Brief explanation

A merit 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 and others may be from the community. The reviewers are asked to rate the proposals on a scale of 1 to 5, 5 being the highest score, as to relevance 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.

Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

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

All of these projects address issues that are of concern to USVI farmers as evidenced by input obtained from our Advisory Council as well as our informal contacts with producers. Because of the shorter project length, the TSTAR program allows scientists to develop projects in response to local needs and concerns expressed by stakeholders.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?

The population of the USVI is over 90% African-American and our programs address the needs of the local population.

3. How will the planned programs describe the expected outcomes and impacts?

Faculty involved in each program establish a set of outcomes for the program. The outcome may consist of the number of local farmers who adopt a new technology or framing practice, how many use a new variety of plant or breed of livestock. The impacts are reported as how these new technologies, varieties or breeds improve the overall operation of individual stakeholders.

4. How will the planned programs result in improved program effectiveness and/or efficiency?

Effectiveness will be enhanced by targeting issues that are highly relevant to tropical agriculture. The programs will address local needs identified by stakeholders. The information generated by the research projects will be disseminated to the appropriate audience so that it can have the most impact.

Efficiency of programs will be improved by using stakeholder input to develop research projects that are relevant to the local community and can eventually have an impact. Issues that are relevant to the USVI, as well as other locations, will also be included in research projects. Encouraging faculty to develop cooperative efforts with scientists outside the region will provide access to technology or assistance that is not available locally.

Stakeholder Input

1. Actions taken to seek stakeholder input that encourages their participation (Check all that apply)

- 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.

Due to the small geographic area of the Virgin Islands, AES scientists work in close contact with the local agricultural community, which fosters considerable communication and responsiveness to farmers' needs. AES programs hold field days that are advertised in the local media (print, TV, radio). Virgin Islands farmers and interested citizens tour current projects and have an opportunity to comment on the work that is being performed. Selected farmers are invited to AES seminars when the topic is relevant to their operations. The AES staff work with members from Farmers in Action, a group of about 25 farmers in St. Croix, to organize special events such as Virgin Islands Agricultural Forums.

2(A). A brief statement of the process that will be 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.

The Agricultural Experiment Station’s Advisory Council meets two times annually. The Council consists of farmers that represent a cross-section of the Virgin Islands farming community, including the President of the St. Thomas Livestock Association and the President of St. Croix Farmers in Action. All AES Program Leaders sit in on the meetings as well as a representative from the Cooperative Extension Service. The farmers are given the opportunity to raise their concerns. AES scientists try to

incorporate researchable issues into their research programs. Non-researchable concerns are referred to CES or appropriate federal or state agencies for action.

2(B). A brief statement of the process that will be used by the recipient institution to identify individuals and groups 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)

Brief explanation

AES programs hold field days that are advertised in the local newspapers. Virgin Islands farmers and interested citizens tour current projects and have an opportunity to comment on the work that is being performed. Selected farmers are invited to AES seminars when the topic is relevant to their operations. The AES staff work with members from Farmers in Action, a group of about 25 farmers in St. Croix, to organize special events such as Virgin Islands Agricultural Forums.

3. A statement of how the input will be considered

- To Identify Emerging Issues
- Redirect Research Programs

Brief explanation.

AES scientists try to incorporate researchable issues into their research programs. Non-researchable concerns are referred to CES or appropriate federal or state agencies for action.

1. Name of the Planned Program

Animal Science - Small Ruminants

2. Program knowledge areas

- 305 Animal Physiological Processes 40 %
- 303 Genetic Improvement of Animals 20 %
- 301 Reproductive Performance of Animals 40 %

3. Program existence

- Intermediate (One to five years)

4. Program duration

- Short-Term (One year or less)

5. Brief summary about Planned Program

Hair sheep are very common in the USVI and the use of Dorper in crossbreeding programs is becoming more popular with producers. This program was developed to evaluate the performance of the Dorper corssbred sheep, in comparison to the indigenous breeds, under the conditions found in the USVI. A sheep flock consisting of St Croix White, Barbados Blackbelly and Dorper X St Croix White ewes will be managed using a pasture based grazing system and accelerated lambing. The ewes will be managed on an 8-month lambing cycle to produce 3 lamb crops every 2 years. The flock will be bred during a 35-day breeding period using single sires within breed with rams of the same breed as the ewes. The ewes will be maintained on guinea grass pastures in a rotational grazing system at a stocking rate of 3-4 hd/acre at all times with a 1-wk rotation during the wet season and a 2-wk rotation during the dry season. Specific ewe production traits to be evaluated will include ovulation rate, pregnancy rate, lambing rate, prolificacy and milk production. Lamb traits to be evaluated include birth weight, weaning weight and pre-weaning average daily gain (ADG). Lamb mortality will also be evaluated at birth, 1 week of age and at weaning.

6. Situation and priorities

Farmers in the US Virgin Islands have purchased Dorper sheep to incorporate into their hair sheep flocks and interest about the performance of the breed under local conditions is increasing. By crossbreeding hair sheep with a large frame breed, such as the Dorper, it has been possible to increase the rate of gain of lambs produced. This has resulted in lambs that can be slaughtered at a younger age and require less resource input by the farmer. All of the livestock production in the USVI is based on a system that relies on forages as the major source of nutrients for the animals. The seasonal availability of forages is one of the limiting factors of sheep production in the tropics. The environment on St. Croix is considered to be semi-arid with seasonal precipitation. The dry period lasts from January through April, and September through December is the wettest time of the year. This seasonal pattern of rainfall leads to a seasonal pattern of forage production with the forage quantity being maximal during the rainy season. The impact of extensive management practices (pasture based) and an accelerated lambing system on the performance of the crossbred animals has not been evaluated.

7. Assumptions made for the Program

It has already been shown that the crossbred lambs grow faster and yield larger carcasses, but the ability of crossbred ewes to achieve production levels similar to those of the indigenous hair sheep breeds is unknown. Preliminary information indicates that the crossbred ewes can be managed using the accelerated lambing system and extensive management of the pasture based grazing. Because the crossbred ewes have genetic traits from the indigenous sheep they should be able to adapt to the environment and management system.

8. Ultimate goal(s) of this Program

This program will demonstrate the utility of using crossbred sheep in production systems that are relevant to the environment in the USVI. The high level of interest in the Dorper breed by the stakeholders indicates that it will be readily accepted and incorporated into existing farms. One caution is that not all of the indigenous sheep be bred to the Dorper sheep so as not to loose the genetic resource of the local hair sheep breeds. Educating local producers on how to manage their flocks to have both crossbred and purebred sheep will be critical.

9. Scope of Program

- In-State Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	2.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0
2011	0.0	0.0	0.0	0.0

Outputs for the Program

13. Activity (What will be done?)

• Conduct research project • Sell breeding stock to local farmers • Present data at conferences • Publish results in scientific journals

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Abstracts presented at conferences

2007 Target: 1
2008 Target: 0
2009 Target: 0
2010 Target: 0
2011 Target: 0

Output Text

Journal articles

2007 Target: 1
2008 Target: 0
2009 Target: 0
2010 Target: 0
2011 Target: 0

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Number of local farmers using crossbred sheep

Outcome Type: Long

2007 Target: 10

2008 Target: 0

2009 Target: 0

2010 Target: 0

2011 Target: 0

20. External factors which may affect outcomes

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

Description

Due to our location the USVI is subject to hurricanes which can hinder research projects. The local economy can also have a negative influence on state appropriations to the university.

21. Evaluation studies planned

- Other (Informal discussions)

Description

Feedback will be obtained from discussions with local farmers either as part of informal meetings or formal meetings (Advisory Board, Field Days, Ag Fair).

22. Data Collection Methods

- Other (informal discussions)

Description

Information obtained through informal discussions with farmers, as well as sales of crossbred animals from the research flock to farmers will be used.

1. Name of the Planned Program

Animal Science - Dairy Cattle

2. Program knowledge areas

- 305 Animal Physiological Processes 20 %
- 306 Environmental Stress in Animals 80 %

3. Program existence

- New (One year or less)

4. Program duration

- Medium Term (One to five years)

5. Brief summary about Planned Program

Dairy cattle in the U.S. Virgin Islands are exposed to heat stress throughout most of the year which results in low fertility and decreased milk production. This project will evaluate the impact of coat color on heat stress in dairy cattle as part of a multistate research project. Digital images of dairy cows will be analyzed for percentage of black hair coat and this information will be used by collaborators in studies on heat stress effects on reproduction, milk production and nutrition of dairy cattle in the south east U.S., Puerto Rico and the U.S.V.I.

6. Situation and priorities

Dairy cattle in the southeast U.S. and the Caribbean are exposed to heat stress throughout most of the year which results in low fertility and decreased milk production. Methods to alleviate heat stress have included environmental modifications, hormonal supplementation, nutrition and genetic selection. Dairy farmers need information on methods to relieve heat stress that are inexpensive and effective. Genetic selection for milk and reproduction has been successful and there is potential for selection for tolerance of hot, humid environments. Selecting for coat color, in addition to production and reproduction traits, may be a way to achieve this.

7. Assumptions made for the Program

Previous data has shown that coat color can have an influence on reproduction and milk production. Dairy cows with less black hair coat had higher milk production that cows with high percentage of black hair. Body temperature of dark cows was also higher that that of light colored cows. By selecting for cows with light colored coats, while maintaining acceptable levels of reproduction and milk production, farmers would be able to mitigate the impact of heat stress even further.

8. Ultimate goal(s) of this Program

Use of coat color as a part of the selection process, along with fertility and milk production, in dairy operations in hot, humid environments.

9. Scope of Program

- Multistate Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	1.0	0.0
2008	0.0	0.0	1.0	0.0
2009	0.0	0.0	1.0	0.0
2010	0.0	0.0	1.0	0.0
2011	0.0	0.0	0.0	0.0

Outputs for the Program

13. Activity (What will be done?)

• Conduct research project • Participate with collaborators

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Abstracts presented

2007 Target: 0
2008 Target: 1
2009 Target: 1
2010 Target: 1
2011 Target: 0

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

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

Outcome Type: Medium

2007 Target: 2
2008 Target: 5
2009 Target: 6
2010 Target: 6
2011 Target: 0

20. External factors which may affect outcomes

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

Description

Due to our location hurricanes are always a potential factor in our research activities. The local economy can also have a negative influence on state appropriatiosn to the university.

21. Evaluation studies planned

- Other ()

Description

{NO DATA ENTERED}

22. Data Collection Methods

- Other ()

Description
{NO DATA ENTERED}

1. Name of the Planned Program

Animal Science - Beef Cattle

2. Program knowledge areas

- 305 Animal Physiological Processes 30 %
- 306 Environmental Stress in Animals 70 %

3. Program existence

- Intermediate (One to five years)

4. Program duration

- Short-Term (One year or less)

5. Brief summary about Planned Program

Temperament is one of the major economic constraints of livestock production in the southern US. Excitable temperaments of livestock lead to lower economic returns for producers. This project will evaluate the temperament in non-traditional tropical breeds of cattle and relate it to production traits that are economically important to the producer.

6. Situation and priorities

Data show that cattle with excitable temperament ratings produced a higher incidence of borderline low quality carcasses than cattle with calm temperament ratings. Studies on temperament of cattle indicate that lower growth rate and reduced meat quality are associated with greater reactivity of animals during handling as indicated by their chute score. Studies to determine the amount of stress on farm animals during routine handling often have shown variable results and are difficult to interpret as related to animal welfare.

7. Assumptions made for the Program

It is important to breed animals with a calm disposition to reduce stress and to improve both productivity and welfare. Increasing public concern about animal welfare is a major reason why major restaurant companies and supermarkets are auditing handling and stunning practices in the United States and abroad. Selecting cattle with mild temperaments coudl lead to higher quality product and increased efficiency of production.

8. Ultimate goal(s) of this Program

Determine if the relationship between temperament and production traits of Senepol cattle is significant and incorporate it into selection procedures for use by livestock producers. Selecting for calmer animals would decrease the incidence of diseases and the use of drugs and increase productivity and efficiency.

9. Scope of Program

- Multistate Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	0.5	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0
2011	0.0	0.0	0.0	0.0

Outputs for the Program

13. Activity (What will be done?)

• Conduct experiments • Work with collaborators in multistate project

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Abstracts

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 1
2011 Target: 0

Output Text

Journal articles

2007 Target: 0
2008 Target: 0
2009 Target: 1
2010 Target: 0
2011 Target: 0

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

# of farmers using temperament to select cattle

Outcome Type: Long

2007 Target: 0
2008 Target: 1
2009 Target: 2
2010 Target: 0
2011 Target: 0

20. External factors which may affect outcomes

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

Description

Due to our location the USVI is subject to hurricanes which can hinder research projects. The local economy can also have a

negative influence on state appropriations to the university.

21. Evaluation studies planned

- Other (d)

Description
{NO DATA ENTERED}

22. Data Collection Methods

- Other ()

Description
{NO DATA ENTERED}

1. Name of the Planned Program

Plant Biotechnology

2. Program knowledge areas

- 206 Basic Plant Biology 40 %
- 204 Plant Product Quality and Utility (Preharvest) 40 %
- 201 Plant Genome, Genetics, and Genetic Mechanisms 20 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

Plant biotechnology will involve the use of molecular biology, tissue culture and conventional propagation for the development of tropical crop plants with enhanced characteristics. The characteristics to be focused on are disease resistance in papaya and grapes, starch modification of cassava and micropropagation systems for pineapple. Transgenic virus resistant inbred papaya lines will be used in breeding to transfer resistance to early bearing large fruited papaya varieties. Genetically enhanced cassava will be developed and evaluated for the starch quality. Transgenic grapes have been developed for disease resistance; however they have not been grown under field conditions. Trials in a vineyard will be undertaken to determine the level and consistency of the imparted disease resistance. An efficient low tech system will be developed for the micropropagation of pineapple that can be utilized throughout the Caribbean and developing countries.

6. Situation and priorities

Papaya ringspot virus is a devastating disease plaguing papaya production throughout the tropical growing regions. Resistance is not available through simple plant breeding. Transgenic plants have been developed by inserting the virus coat protein gene to suppress infection and create resistance. Cassava starch production has potential as a value added commodity as well as use in biofuels. Cassava is drought tolerant and productive on poor soils both situations are found in the U.S. Virgin Islands. Table, as well as wine making, grapes are beset upon by three major diseases which limit their growth and production in the Caribbean. These diseases include powdery mildew, downy mildew and Pierce's disease. To curb the total import of table grape for local consumption disease resistant varieties need to be developed. Pineapple is a slow growing plant that produces limited propagules for increase in plant numbers. Limited shoot production makes it difficult to obtain the number of plants needed for large planting. A few cultivars are available through tissue culture companies. However, the common cultivars and newest varieties are not commercially. Micropropagation has the potential to quickly increase the number of plants in a short amount of time.

7. Assumptions made for the Program

A major assumption is that genes, inserted through genetic engineering will result in plants with the characteristics desired that are stable over multiple generations. Our results have indicated that genetic stability can be maintained for at least three generations. Transgenic plants have not been a concern to farmers and consumers that have seen the benefits that disease resistance, obtained through molecular techniques, can have on production and fruit quality. They have been supportive of this work and have seen the potential benefits the results may have for them. The public will be kept informed of the research being conducted and questions answered regarding any concerns they may have. Pineapple has been grown in tissue culture and found to produce multiple shoots on a limited number of varieties. It is expected that new varieties and old cultivars will respond similarly with slight modifications to the plant tissue culture medium.

8. Ultimate goal(s) of this Program

Papaya – To develop virus resistant transgenic early bearing lines with high fruit quality on a compact plant and demonstrate that transgenic fruits are safe to grow. Cassava – Use molecular genetics to isolate and develop genetically enhanced plants with modified starch quality that can be used for industrial purposes. Pineapple - To develop a micropropagation system for the in vitro multiplication of pineapple that can be achieved with minimal technical equipment and applicable to the Caribbean region. Grape – To apply genetic engineering for the development of disease resistant table grapes that can be grown in tropical environments.

9. Scope of Program

- In-State Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	1.5	0.0
2008	0.0	0.0	1.5	0.0
2009	0.0	0.0	1.5	0.0
2010	0.0	0.0	1.5	0.0
2011	0.0	0.0	1.5	0.0

Outputs for the Program

13. Activity (What will be done?)

• 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

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

{NO DATA ENTERED}

Target: {NO DATA ENTERED}
Target: {NO DATA ENTERED}
Target: {NO DATA ENTERED}
Target: {NO DATA ENTERED}
Target: {NO DATA ENTERED}

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Number of local farmers growing micropropagated pineapple

Outcome Type: Long

2007 Target: 1
2008 Target: 2
2009 Target: 3
2010 Target: 4
2011 Target: 5

20. External factors which may affect outcomes

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

Description

Due to our location the USVI is subject to hurricanes which can hinder research projects. The local economy can also have a negative influence on state appropriations to the university. Federal certification for public release requires multiple years of field trials and documentation to obtain approval and approval is not guaranteed.

21. Evaluation studies planned

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

Description

Feedback will be obtained from discussions with local farmers either as part of informal meetings or formal meetings (Advisory Board, Workshops, Field Days, Ag Fair).

22. Data Collection Methods

- {NO DATA ENTERED}

Description

{NO DATA ENTERED}

1. Name of the Planned Program

Plant Germplasm Conservation and Enhancement

2. Program knowledge areas

- 202 Plant Genetic Resources 80 %
- 205 Plant Management Systems 20 %

3. Program existence

- Intermediate (One to five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

The use and maintenance of diverse germplasm are the key elements of successful plant breeding programs. The conservation and use of a comprehensive collection of genetically varied cultivated plants and their relatives are the biological foundation for the long-term success of U.S. agricultural producers. Different selection and evaluation methods are used to develop cultivars within and among different tropical crop species, but elite germplasm is necessary in all instances to develop new superior cultivars. Evaluation, development and enhancement require long-term commitments (20 to 40 years) to produce superior germplasm sources. Today the goal for project completion involves a 5 to 10-year time horizon. To ensure future genetic advances, a long-term commitment is needed to increase genetic diversity of cultivated crops and to develop and enhance elite germplasm.

6. Situation and priorities

The Caribbean basin is a source of multiple tropical fruit and root crop species used in the local diet. Some of the established varieties still commonly grown by farmers are over 100 years old as found in cassava and pineapple. These old varieties need to be conserved for their genetic integrity. However, some of these varieties may not be the most productive of have the quality of some of the newer selected varieties. Import and quarantine restrictions limit the farmer's choice of plant material. The University of the Virgin Islands plays a key role in bringing in new varieties, evaluating them for their fruit quality and production potential and using them as breeding stock to improve existing material. In the USVI a preference is for larger, 1-2 kg fruit in papaya. However, most commercial export varieties develop in Hawaii produce 0.25- 0.5 kg fruit. Breeding and selection is needed to incorporate the sweeter and firmer fruit characteristics into the larger fruited Caribbean varieties.

7. Assumptions made for the Program

Early bearing papaya varieties have been developed and are being utilized by farmers. However, pests and diseases continue to plague the crop. Breeding and selection is needed to continue to make improvements to the crop. Pineapples have been gaining interest on the island. Farmers are looking for a productive and high quality fruit producing plant. The established Caribbean varieties have spines and lack the sweetness and low acid content of the newer hybrid.

8. Ultimate goal(s) of this Program

• Papaya: Develop and enhance germplasm to broaden the genetic base for disease and pest resistance through breeding and selection. Improve the yield and fruit quality with the development of early bearing cultivars. • Pineapple: Identify plant varieties with improved fruit quality and productive in sustainable, integrated cropping systems. • Cassava: Evaluate germplasm with modified characteristics to improve the production and quality of the starch. • Orchids: Develop tissue culture protocols for the seed germination of the remaining two native species.

9. Scope of Program

- In-State Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	1.5	0.0
2008	0.0	0.0	1.5	0.0
2009	0.0	0.0	1.5	0.0
2010	0.0	0.0	1.5	0.0
2011	0.0	0.0	1.5	0.0

Outputs for the Program

13. Activity (What will be done?)

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

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
{NO DATA ENTERED}	{NO DATA ENTERED}

18. Output measures

Output Text

{NO DATA ENTERED}

Target: {NO DATA ENTERED}
Target: {NO DATA ENTERED}
Target: {NO DATA ENTERED}
Target: {NO DATA ENTERED}
Target: {NO DATA ENTERED}

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Number of local farmers growing selected plant varieties

Outcome Type: Long

2007 Target: 3
2008 Target: 8
2009 Target: 10
2010 Target: 15
2011 Target: 20

20. External factors which may affect outcomes

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

Description

Due to our location the USVI is subject to hurricanes which can hinder research projects. The local economy can also have a

negative influence on state appropriations to the university.

21. Evaluation studies planned

- During (during program)

Description

Feedback will be obtained from farmers that grow and evaluate new varieties released under their growing environment (Workshops, Field Days, Ag Fair).

22. Data Collection Methods

- Sampling

Description

On farm interviews with farmers growing new varieties.

1. Name of the Planned Program

Agronomy - Tropical hay production

2. Program knowledge areas

- 205 Plant Management Systems 60 %
- 204 Plant Product Quality and Utility (Preharvest) 40 %

3. Program existence

- Intermediate (One to five years)

4. Program duration

- Short-Term (One year or less)

5. Brief summary about Planned Program

Tropical legumes will be analyzed for their ability to produce high quality hay in the U.S. Virgin Islands. One perennial (Clitoria ternatea) and two annual (Vigna unguiculata and Lablab purpureus) legumes will be examined in small plot clipping studies for establishment, curing time, cutting height, cutting interval, and pasture longevity. Results from small plot experiments will be applied to large plot hay production to ascertain the best management techniques for producing high quality legume hay square bales. An economic/market analysis will be compiled with data resulting from the production and sale of legume hay.

6. Situation and priorities

In the Virgin Islands, the dominant pasture forage for livestock production is guinea grass (Panicum maximum). During cyclic dry periods on St. Croix, nutritive value and forage availability are greatly reduced. In response to harvest intervals from 6 to 12 months, crude protein (CP) concentration of guinea grass averaged 4.6%, and seasonal CP ranged from 4.2 to 6.5%. Lower CP and increased fiber levels are characteristically observed during the dry season. These factors can place nutritional stress on livestock, thus the need for high quality supplemental feed is apparent. However, in the tropics, conventional systems of forage conservation in the form of hay and silage have not been widely adopted for various reasons, the main being the fibrous nature of tropical grasses.

Research is needed to study the mechanisms and factors affecting the production of leguminous hay in the tropics. Factors such as establishment, persistence, cutting height, and level of maturity at cutting need further assessment. In addition, knowledge of which legume has the potential to provide the best hay source in regards to leaf retention, quality, yield, stand persistence, and post-harvest quality characteristics is needed to make further tropical hay production decisions. The effects of growing season, moisture requirements, and pasture re-growth need clarification for proper hay pasture management. Understanding these effects and parameters is essential for legume hay production to be successful in the Virgin Islands.

7. Assumptions made for the Program

Legumes are an important forage component in any livestock production operation. Legumes have been shown to increase forage yield and the nutritive component of pasture systems. Increases in forage quality as a direct result of legume incorporation into grazing management translates to increased stocking rates and live weight gains. Improved pastures utilizing legumes have been shown to increase live weight gains and average daily gains for pasture finished lambs and goats.
During periods of low rainfall, as occurs from June through August in the Virgin Islands, increased levels of nutrition are needed to meet livestock demands. The lack of adequate moisture results in pasture quality deterioration. Legume hay provides an excellent source of protein when quality pasture deteriorates.

8. Ultimate goal(s) of this Program

This program will assess management techniques (establishment, curing time, cutting height, cutting interval, and pasture longevity) needed to produce the greatest quantities of high quality blue pea hay in a tropical environment. Throughout each phase of the experiment we will quantify yield, nutritive value, persistence, and production efficiency of blue pea, cowpea, and lablab through small plot performance for the purpose of commercial hay production. Finally, we will determine the economic viability of locally produced legume hay, and to evaluate the market potential for square bale production as an alternative to round bale production in the Virgin Islands.

9. Scope of Program

- In-State Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	4.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0
2011	0.0	0.0	0.0	0.0

Outputs for the Program

13. Activity (What will be done?)

• Conduct research project
• Sell hay to local framers
• Present data at conferences
• Publish results in scientific journals
• Conduct local and regional seminars

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Abstracts presented at conferences

2007 Target: 1
2008 Target: 0
2009 Target: 0
2010 Target: 0
2011 Target: 0

Output Text

Journal articles

2007 Target: 1
2008 Target: 0
2009 Target: 0
2010 Target: 0
2011 Target: 0

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Number of local farmers utilizing legume hay and adoption of legume hay production techniques by local area farmers and the USVI Department of Agriculture.

Outcome Type: Short

2007 Target: 10

2008 Target: 0

2009 Target: 0

2010 Target: 0

2011 Target: 0

20. External factors which may affect outcomes

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

Description

Due to our location the USVI is subject to hurricanes which can hinder research projects. The local economy can also have a negative influence on state appropriations to the university.

21. Evaluation studies planned

- Retrospective (post program)

Description

Feedback will be obtained from discussions with local farmers either as part of informal meetings or formal meetings (Advisory Board, Field Days, Ag Fair).

22. Data Collection Methods

- Other (informal discussions)

Description

Information obtained through informal discussions with farmers, as well as sales of legume hay square bales to farmers will be used.

1. Name of the Planned Program

Horticulture

2. Program knowledge areas

- 216 Integrated Pest Management Systems 10 %
- 102 Soil, Plant, Water, Nutrient Relationships 30 %
- 202 Plant Genetic Resources 20 %
- 133 Pollution Prevention and Mitigation 10 %
- 205 Plant Management Systems 30 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Medium Term (One to five years)

5. Brief summary about Planned Program

Vegetable crops are grouped according to priority and economic importance. Grouping is based on market and consumer demands. Vegetable groups consist of: l) high-demand crops (tomato, cucumber, okra, bell pepper, okra and eggplant); and 2) low demand crops (collard greens, beans, cantaloupes, watermelons, onions, squash, and yard long bean). Cultivars for each vegetable crop will be evaluated for two or three seasons each year using sustainable vegetable production methods including organic fertilizers and mulches, and rotation with cover crops (lablab) as green manure. Sustainable production system will be compared to conventional production systems. Cultivar selection will be based on disease resistance characteristics according to the prevailing disease incidence in the USVI.

6. Situation and priorities

The horticulture industry in the U.S. Virgin Islands (USVI) is in the state of continuous decline attributed to a decreasing number of farmers over the years. Presently, 95% of the agriculture commodities consume in the territory is imported. Crop production is constrained by poor soil and water characteristics, high incidence of pests and diseases, poor crop management practices including the use of old and low yielding crop cultivars, and high costs of imported inputs. Vegetables can be produced all year round and there is high market demand for them, but farmers failed to meet this demand due to inefficient cropping system and management method that restrict crop performance. High quality produce demands good market prices, but can be achieved only if farmers use improved crop management practices. This program focuses on the selection of pest and disease resistant cultivars integrated with crop rotation and cover crops to improve soil quality and fertility for year-round production of high quality fruits and vegetables. Development of sustainable production systems for vegetable crops is important to reduce production costs and increase profitability of USVI farmers, and to reduce the dependency of imported agricultural commodities.

7. Assumptions made for the Program

Disease resistant varieties have been reported to perform successfully in reducing the incidence of a particular disease. These varieties, however, have been bred under intensive input management systems and their performance under low input conditions is unknown. Consequently, there is a need to identify and evaluate new vegetable cultivars for the best fit under low input sustainable production systems in the USVI. Many studies have reported the benefits of cover crops in reducing weeds, fixing nitrogen, recycling nutrients, and adding organic matter to the soil. In addition, cover crops and crop rotations offer potential in integrated pest management of vegetables crops that may reduce the use of expensive pesticides. The use of disease resistant varieties and sustainable management practices are expected to reduce disease incidence and production cost of vegetable crops in the USVI.

8. Ultimate goal(s) of this Program

This program will develop low-cost and profitable production system for year-round vegetable production in the USVI. The reduce pesticide and fertilizer requirements will be readily adopted by farmers with limited resources. Increasing production of vegetable crops will impact positively in the local economy by reducing imports from the mainland and other Caribbean countries.

9. Scope of Program

- In-State Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	2.0	0.0
2008	0.0	0.0	2.0	0.0
2009	0.0	0.0	2.0	0.0
2010	0.0	0.0	4.0	0.0
2011	0.0	0.0	0.0	0.0

Outputs for the Program

13. Activity (What will be done?)

Conduct research
Present data at conferences
Publish results in scientific journals

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Research citations

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 0
2011 Target: 0

Output Text

Abstracts presented at conferences

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 0
2011 Target: 0

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

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

Outcome Type: Short

2007 Target: 1
2008 Target: 1
2009 Target: 0
2010 Target: 0
2011 Target: 0

Outcome Text

# of farmers using selected cultivars

Outcome Type: Medium

2007 Target: 0
2008 Target: 3
2009 Target: 10
2010 Target: 0
2011 Target: 0

Outcome Text

farmers adopting sustainable production systems

Outcome Type: Long

2007 Target: 0
2008 Target: 1
2009 Target: 5
2010 Target: 0
2011 Target: 0

20. External factors which may affect outcomes

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

Description

The occurring storms and hurricanes in the USVI can affect results of research projects. The local economy may have negative effect on state appropriations to the University.

21. Evaluation studies planned

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

Description

Feedback from extension educators and farmers will be obtained during and after program through formal and informal meetings.

22. Data Collection Methods

- {NO DATA ENTERED}

Description

{NO DATA ENTERED}

1. Name of the Planned Program

Irrigation

2. Program knowledge areas

- 111 Conservation and Efficient Use of Water 30 %
- 405 Drainage and Irrigation Systems and Facilities 20 %
- 132 Weather and Climate 10 %
- 102 Soil, Plant, Water, Nutrient Relationships 30 %
- 205 Plant Management Systems 10 %

3. Program existence

- Intermediate (One to five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

Field experiments will be conducted in the US Virgin Islands (USVI) to improve micro-irrigation strategies and water use efficiency in horticultural crops. Soil moisture monitoring devices (capacitance based sensors) will be integrated with control systems to provide feedback for irrigation scheduling and optimization of water use. The strategies will be based on soil moisture levels of 10, and 30 kPa in comparison to fixed irrigation scheduling and rain-fed control for vegetables and fruit trees, respectively. In addition, horticultural crops will be grown in a shade-house under micro-irrigation to reduce water requirements. Water use under 30%, 50% and 70% shade will be measured to determine evapo-transpiration coefficients and water use efficiency.

6. Situation and priorities

Water is the most limiting constraint to agricultural production in the USVI. Existing ponds and dams are not sufficient to effectively store water for agricultural purposes. Underground water is used primarily for urban consumption together with desalinized seawater which makes it very expensive for the horticultural industry. Growers are aware of the benefits of micro-irrigation technology, however, water costs and availability as well as irrigation strategies have shown to be the limiting factor for crop production and hence for adoption. Knowledge about automatic control systems and water management strategies as well as water requirements (crop coefficients) will contribute to improve irrigation efficiency and water use efficiency. In addition, promoting production of shade loving crops will also increase water use efficiency and reduce water requirements for crop production in the USVI.

7. Assumptions made for the Program

Irrigation strategies based on soil water availability and plant requirement will improve irrigation efficiency. Soil moisture levels maintained slightly below field capacity and amount of water applied according to evapo-transpiration will reduce losses by percolation and run off. In the case of shade crops, less water will be needed to dissipate the reduced solar energy reaching the plant canopy. In addition, ground and air temperature as well as wind will decrease and relative humidity will increase under shade reducing evapo-transpiration. Excess of shade, however, may reduce photosynthesis affecting yield and crop quality.

8. Ultimate goal(s) of this Program

The ultimate goal of this program is adoption of irrigation strategies based on soil moisture and water requirements (evapo-transpiration) to increase irrigation efficiency in the USVI. A second long term goal is

to increase production of shade crops to increase water use efficiency and, consequently, reduce water requirements and the dependency on expensive off farm irrigation water.

9. Scope of Program

- In-State Research
- Multistate Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	2.0	0.0
2008	0.0	0.0	2.0	0.0
2009	0.0	0.0	2.0	0.0
2010	0.0	0.0	0.0	0.0
2011	0.0	0.0	0.0	0.0

Outputs for the Program

13. Activity (What will be done?)

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

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Abstract presented at conference

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 0
2011 Target: 0

Output Text

Research citations

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 0
2011 Target: 0

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

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

Outcome Type: Short

2007 Target: 1
2008 Target: 0
2009 Target: 0
2010 Target: 0
2011 Target: 0

Outcome Text

Knowledge of water requirements in shade crops production

Outcome Type: Medium

2007 Target: 1
2008 Target: 1
2009 Target: 0
2010 Target: 0
2011 Target: 0

Outcome Text

# of farmers growing shade crops

Outcome Type: Long

2007 Target: 0
2008 Target: 1
2009 Target: 5
2010 Target: 0
2011 Target: 0

Outcome Text

farmers adopting irrigation strategies based on soil moisture

Outcome Type: Long

2007 Target: 0
2008 Target: 2
2009 Target: 10
2010 Target: 0
2011 Target: 0

20. External factors which may affect outcomes

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

Description

The occurring storms and hurricanes in the USVI can affect research projects and adoption of new technology. Costs of the technology may affect adoption also.

21. Evaluation studies planned

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

Description

Feedback from extension educators and farmers will be obtained during and after program through formal and informal meetings.

22. Data Collection Methods

- {NO DATA ENTERED}

Description

{NO DATA ENTERED}

1. Name of the Planned Program

Aquaculture - Biofloc systems

2. Program knowledge areas

- 403 Waste Disposal, Recycling, and Reuse 20 %
- 307 Animal Management Systems 80 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

The UVI Aquaculture Program has distinguished itself in the area of biofloc aquaculture systems, which represent a significant advance over traditional pond culture. Therefore, work is planned to improve initial positive results and develop a technology package that involves different uses, scales, species and byproducts. The facilities for this work consist of three 11.8-m3 biofloc systems, six 30-m3 systems and one 200-m3 system. These systems will be used for the production of tilapia and Pacific White shrimp. All systems will be equipped to aerate and mix the culture water and remove solid waste. The 200-m3 system will also include external channels to remove inorganic nitrogenous waste and recycle nutrients into flowing aquatic plants. Conditioned water from previous experiments will be reused to expedite the development of an active biofloc (biofilter) at the start of subsequent experiments. Fish and/or shrimp will be stocked at varying rates and fed a complete diet two or three times daily until they reach harvestable size. Water quality will be monitored and base will be added to maintain a suitable pH. At harvest the fish and/or shrimp will be weighed and counted to determine growth rate, average body weight, total production level, survival and feed conversion ratio. Power consumption, water use and sludge production will be measured. A number of experiments will address the development of polyculture systems that integrate tilapia and shrimp production. Biofloc systems will be developed for nursery and growout operations. When a system has reached a satisfactory level of development, an enterprise budget will be prepared.

6. Situation and priorities

The U.S. has a multibillion dollar deficit in seafood and fishery products. Most of the major fisheries in the world are in a perilous state. Some have collapsed and many are in danger of collapsing. Another major problem with wild fish stocks is contamination with PCBs, mercury and other heavy metals. Aquaculture is increasingly called upon to meet the growing shortfall in wild fish stocks and produce a safer product. However, aquaculture has been criticized for its use of environmentally delicate coastal land and its pollution of natural water bodies with nutrients and organic waste. Nearly a third of the feed given to cultured species goes toward the formation of sludge on a dry weight basis. However, on a wet weight basis the volume of sludge is 50 times higher than its dry weight volume. Sludge can blanket the bottom sediments of water bodies, killing natural organisms that sustain wild fish populations and depleting dissolved oxygen. The waste nutrients from aquaculture operations cause the excessive growth of algae (eutrophication), which can drastically alter ecosystems and even precipitate total collapse. While the supply of seafood is under assault due to overfishing, environmental degradation and population growth, the need for a low-fat diet that seafood provides has never been greater, as attested by the rampant obesity in American and proliferation diet-induced diseases such as high blood pressure and adult onset diabetes. Therefore, methods need to be developed for producing more seafood while reducing

environmental impact. Preliminary results of the UVI biofloc system show that it is 30 times more productive than ponds culture. This means that the production of fish through biofloc technology reduces land and water use by nearly 97%. Adoption of this technology will lead to greater availability of seafood, utilize fewer resources than current pond technology and minimize environmental impact. Solid and nutrient wastes, which are recovered from biofloc systems, can be used to fertilize and irrigate field crops and improve soil structure.

7. Assumptions made for the Program

The facilities for this program are in place. In addition to the present experimental biofloc systems, all ancillary support systems are in place such as electrical systems, water supply, storage areas, feed supply, chemical supply, water quality laboratory, computers and office space. The program is capable of breeding tilapia and producing fry and advanced fingerlings. There is a regional supplier of Pacific White shrimp post larvae. There is capable staff of four trained and experienced aquaculturists, of which one has a Ph.D. degree, two have M.S. degrees and one has a B.S. degree. There is a UVI farm store where products from research program will be sold to the public and generate interest in the farming community. The Aquaculture Program has a successful history of conducting research and disseminating the results through publications, conference presentations, seminars, workshops and an annual short course. There is considerable interest in biofloc technology. In 8 years the short course has attracted more than 200 participants from 26 states, four U.S. territories and 30 countries. The Aquaculture Program has been inundated with requests for information about biofloc systems and has received several requests to speak at conferences about these systems, which are seen by many in the aquaculture industry as a significant advance.

8. Ultimate goal(s) of this Program

The ultimate goal of this program is to develop a highly productive, cost effect biofloc production system that is widely adopted by the aquaculture industry, which in turn leads to an increased supply of fish, a reduction in the seafood trade deficit, increased seafood consumption and improved health.

9. Scope of Program

- In-State Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	1.5	0.0
2008	0.0	0.0	1.5	0.0
2009	0.0	0.0	1.5	0.0
2010	0.0	0.0	1.5	0.0
2011	0.0	0.0	1.5	0.0

Outputs for the Program

13. Activity (What will be done?)

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

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Abstracts presented at conferences

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 1
2011 Target: 1

Output Text

Journal articles

2007 Target: 1
2008 Target: 0
2009 Target: 1
2010 Target: 0
2011 Target: 1

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Number of new farmers anywhere adopting aquaponic technology

Outcome Type: Medium

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 1
2011 Target: 1

20. External factors which may affect outcomes

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

Description

Due to our location the Virgin Islands is subject to hurricanes which can hinder research projects. The

local economy can also have a negative influence on state appropriations to the university.

21. Evaluation studies planned

- During (during program)

Description

An evaluation form will be filled out by all participants of training programs. A follow-up e-mail survey will be conducted 2 years after training has been received to determine if all or any part of the technology has been adopted. Observations will be made of commercial development anywhere using biofloc technology developed at UVI.

22. Data Collection Methods

- Whole population
- On-Site
- Observation

Description

{NO DATA ENTERED}

1. Name of the Planned Program

Aquaculture – Aquaponic Systems

2. Program knowledge areas

- 307 Animal Management Systems 30 %
- 403 Waste Disposal, Recycling, and Reuse 30 %
- 205 Plant Management Systems 40 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

The UVI Aquaculture Program has been the vanguard for the development of aquaponic technology in the U.S. The impetus for this area of research has been the dry conditions in the Virgin Islands and the need to produce fish intensively and reuse the culture water. However, the accumulation of nutrients in the culture water requires a greater water exchange (5%) rate than is feasible with limited water supplies. Incorporating hydroponic vegetables into the system reduces the exchange rate to 1.5%, recovers nutrients that would otherwise be wasted, and produces a valuable crop of vegetables. More aquaponic research is needed to develop enterprise budgets for different plant crops, to find cheaper and easier construction methods, and to evaluate component options. The facilities currently available are six replicated experimental raft aquaponic systems with a 14.3-m2 plant growing area and one commercial-scale aquaponic system with a 214-m2 plant growing area. The systems will be stocked with advanced tilapia fingerlings (~50 g), which will be fed three times daily ad libitum with a complete diet of floating pellets. After 24 weeks of culture, the fish will be harvested, weighed and counted to determine daily growth rate, average body weight, final rearing tank biomass, feed conversion ratio and survival. Vegetables will be seeded in trays to produce seedlings, which will be transplanted into net pots supported by floating polystyrene rafts. Biological methods will be used to control pests and diseases. At harvest the vegetables will be sorted into marketable and non-marketable categories and weighed. Production results for each type of vegetable along with fish production results will be used to develop enterprise budgets for the commercial-scale aquaponic system. Alternatives to current construction materials are needed to simplify logistics and reduce system cost. Ferrocement will be evaluated as an alternative to fiberglass and high density polyethylene liners. The UVI system currently employs clarifiers for solids removal and raft hydroponic tanks. To reduce the space requirements of clarifiers and their cost, compact swirl separators will be evaluated. Nutrient film technique (NFT) is a viable option to rafts for the hydroponic component. Experiments will be conducted to determine NFT aquaponic design criteria and the advantages and disadvantages of NFT over raft culture.

6. Situation and priorities

The Virgins Islands are semi-arid due to the relatively even the distribution of rainfall, constant trade winds, warm temperatures and high solar radiation. There are no rivers or streams and a very limited supply of fresh ground water. Vegetables are under water stress most months of the year, and there is a shortage of irrigation water available for producing them. Consequently, more than 95% of vegetables are imported. Likewise, the majority of seafood is imported. Local fish stocks have declined due to the overfishing of fragile reef ecosystems with traps. Consuming reef fishes poses another problem – fish poisoning. Large predator reef fish often bioaccumulate a naturally occurring toxin known as

ciguatera. Many people who consume large quantities of locally caught seafood have experienced fish poisoning, which often deters them from further seafood consumption and thus eliminates an important dietary source of nutrients and the health benefits associated with them. Imported frozen fish lack the quality of fresh fish and are not as appealing to consumers. Importation of most food items drains money from the local economy, which relies precariously on tourism. Agricultural development, including aquaculture, would help diversify and stabilize the economy and provide healthy food options. The Virgin Islands government is interested in expanding the agricultural sector and has increased funding. Health care providers are encouraging Virgin Islanders to adopt better diets, including the consumption of more fresh vegetables and fish, to stem the crisis of obesity, high blood pressure and adult onset diabetes. To overcome environmental constraints and increase local food supplies new production technology such as aquaponics is needed. The UVI Aquaculture Program has developed small and commercial aquaponic systems that are reliable, productive and well suited for the Virgin Islands. The UVI aquaponic commercial-scale system is capable of producing more than 20,000 lbs. of fish and vegetables on 1/8th acre of land with water supplied solely through rainwater harvesting. Adoption of aquaponic technology in the Virgin Islands would increase the local supply of fish and vegetables, improve the economy and provide health benefits to consumers.

7. Assumptions made for the Program

The facilities for this program are in place. In addition to the present experimental and commercial aquaponic systems, all ancillary support systems are in place such as electrical systems, water supply, storage areas, feed supply, plant nursery supplies, chemical supply, water quality laboratory, computers and office space. The program is capable of breeding tilapia and producing fry and advanced fingerlings. The program is also capable of producing vegetable seedlings in planting trays in a greenhouse. There is capable staff of four trained and experienced aquaculturists, of which one has a Ph.D. degree, two have M.S. degrees and one has a B.S. degree. There is a UVI farm store where products from the research program will be sold to the public and generate interest in the farming community. The Aquaculture Program has a successful history of conducting research and disseminating the results through publications, conference presentations, seminars, workshops and an annual short course. There is considerable interest in aquaponics. In 8 years the short course has attracted more than 200 participants from 26 states, four U.S. territories and 30 countries. The Aquaculture Program has offered half day workshops on aquaponics, which are attended by local farmers and the general public. The program leader has written a quarterly question and answer column for 7 years for Aquaponics Journal, a trade publication. The Aquaculture Program has been inundated with requests for information about aquaponic systems and has received several requests to speak at conferences about aquaponic systems.

8. Ultimate goal(s) of this Program

The ultimate goal of this program is to develop profitable aquaponic systems that are adopted by Virgin Islands farmers and used to increase the local supply of fresh fish and vegetables.

9. Scope of Program

- In-State Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	2.0	0.0
2008	0.0	0.0	2.0	0.0
2009	0.0	0.0	2.0	0.0
2010	0.0	0.0	2.0	0.0
2011	0.0	0.0	2.0	0.0

Outputs for the Program

13. Activity (What will be done?)

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

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Abstracts presented at conferences

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 1
2011 Target: 1

Output Text

Journal articles

2007 Target: 1
2008 Target: 0
2009 Target: 1
2010 Target: 0
2011 Target: 1

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Number of new farmers anywhere adopting aquaponic technology

Outcome Type: Medium

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 1
2011 Target: 1

20. External factors which may affect outcomes

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

Description

Due to our location the Virgin Islands is subject to hurricanes which can hinder research projects. The local economy can also have a negative influence on state appropriations to the university.

21. Evaluation studies planned

- During (during program)

Description

An evaluation form will be filled out by all participants of training programs. A follow-up e-mail survey will be conducted 2 years after training has been received to determine if all or any part of the technology has been adopted. Observations will be made of commercial development anywhere using biofloc technology developed at UVI.

22. Data Collection Methods

- Whole population
- Mail
- On-Site
- Observation

Description

{NO DATA ENTERED}

1. Name of the Planned Program

Whole Farm Systems Research

2. Program knowledge areas

- 307 Animal Management Systems 10 %
- 205 Plant Management Systems 40 %
- 601 Economics of Agricultural Production and Farm Management 30 %
- 403 Waste Disposal, Recycling, and Reuse 20 %

3. Program existence

- Intermediate (One to five years)

4. Program duration

- Medium Term (One to five years)

5. Brief summary about Planned Program

A small integrated model farm has been established at UVI to conduct whole farm systems research. The 5-acre farm consists of the following components: 1-acre rainwater catchment, 500-m3 water storage pond, seven 80-m3 fish tanks, 150-m3 sludge storage pond, 24-m3 mixing pond, 3.2-acres of crop production. The farm is completely enclosed by an 8-ft high fence. Rainwater from the catchment will collect in the storage pond and be pumped to the fish rearing tanks. Nile tilapia will be cultivated using a biofloc system and continuous aeration in the fish rearing tanks, which will be stocked with advanced fingerlings (~50 g) at a rate of 25 fish/m3 and fed ad libitum twice a day with a complete floating diet containing 32% protein for 6 months. Production will be staggered so that one tank will be harvested each month. The fish will be weighed and counted at stocking and harvest to determine growth rate, average body weight, total production level, survival and feed conversion ratio. The bottom of the fish tank slopes to a central cone where sludge will collect and be removed daily by opening a valve in the drain line. Sludge from all the tanks will flow to a sludge storage pond. Solid waste from the sludge pond will be composted along with plant residues and incorporated into the soil before planting. Clarified and filtered water from the sludge ponds will be blended with rainwater from the storage pond or municipal water and used to drip irrigate the field crops. The farm will produce approximately 30 vegetable crops and one fruit crop (bananas) on a continuous basis. The optimum crop mix, planting schedules, irrigation rates, pest control and fallow periods will be determined based on previous research a UVI and on on-site experience. All crops will be started in seedling trays in a shade house and transplanted to the field. All harvested fruit and vegetables will be sorted into marketable and unmarketable product and weighed. Records of all inputs and outputs of the farm will be kept. The fish, vegetables and fruit will be sold at the UVI Farm Store at retail prices. Enterprise budgets for the whole farm will be prepared. Water budgets will be determined. Nutrient budgets and soil composition will be determined over time for small sub samples of the farm. The benefits of integration will be documented.

6. Situation and priorities

Most farmers in the Virgin Islands have small holdings and pursue farming on a part-time basis to supplement income from other economic activities. This scale of farming contributes minimally to the supply of vegetables and fruits, most of which are imported, and does not provide youth with an example of farming as a full-time profitable profession. The small integrated model farm will be operated intensively with a large mix of products to determine if farming at a larger scale in the Virgin Islands than currently practiced is economically feasible. If the results show that farming at this scale is profitable, youth might be encouraged to go into farming. More than 25 years of tilapia, vegetable and fruit research has been

conducted at the UVI experiment station. The results of this research appear in numerous publications, many of which are no longer available or have been written for the scientific community. This information has never been synthesized into recommendations for a whole integrated farming system. Most of the experiments reported in these publications have not involved integration. Therefore, a model farm will provide a continuous living example of the best farm practices for the Virgin Islands.

7. Assumptions made for the Program

The small integrated model farm is in continuous production as a number of systems are being developed to optimize production. The major systems are fish production, solids and waste nutrient utilization in compost and irrigation water, and crop rotations. The farm is being operated commercially to determine if integration of water harvesting, fish production and crop production is economically feasible on a 5-acre scale in the Virgin Islands. A technical committee of nine agricultural professionals meets monthly to assess progress and offer advice. The team represents AES, CES and the local Department of Agriculture. Of the nine team members, four have Ph.D. degrees, four have M.S. degrees and one has a B.S. degree. The team members present the disciplines of horticulture, biotechnology, aquaculture, animal science and business. One of these committee members is the farm manager and supervises three field workers attached to the project. A farmer's advisory committee is being developed. It will meet twice annually. Produce is being sold at retail prices at the UVI Farm Store to simulate a roadside farmer's market. An enterprise budget for the farm will show where it is feasible to reduce costs or increase revenues. The budget will continuously evolve as new crop combinations are tried. Field days, tours, fact sheets, bulletins and an Internet site will expose farmers, students and the public to the results of this project. Farmers may not be able to duplicate the entire model farm but could adopt portions of the project. The budgets could be used to aid farmers in getting agricultural loans for similar operations in the private sector. If good profitability can be clearly demonstrated, youth may be encouraged to enter farming. Widespread application of this integrated farming system could increase availability of local fresh fish, vegetables and fruit. Increased activity in the farming sector could help diversify and stabilize the Virgin Islands economy.

8. Ultimate goal(s) of this Program

The ultimate goal of this project is to determine whether or not an integrated 5-acre model farm involving rainwater harvesting, fish production and crop production is economically feasible in the Virgin Islands. If it is economically feasible, farmers will be encouraged to adopt this model in an effort to increase income and the availability of fresh local produce.

9. Scope of Program

- In-State Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	1.0	0.0
2008	0.0	0.0	1.0	0.0
2009	0.0	0.0	1.0	0.0
2010	0.0	0.0	1.0	0.0
2011	0.0	0.0	1.0	0.0

Outputs for the Program

13. Activity (What will be done?)

Conduct research project
Present data at conferences
Publish results in scientific journals, farmers bulletins and fact sheets

14. Type(s) of methods will be used to reach direct and indirect contacts

Extension	
Direct Method	Indirect Methods
• {NO DATA ENTERED}	• {NO DATA ENTERED}

15. Description of targeted audience

{NO DATA ENTERED}

16. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Abstracts presented at conferences

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 1
2011 Target: 1

Output Text

Journal articles, farmers bulletins, fact sheets

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 1
2011 Target: 1

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Number of local farmers who adopt some portion of model farm

Outcome Type: Medium

2007 Target: 0
2008 Target: 1
2009 Target: 1
2010 Target: 1
2011 Target: 1

20. External factors which may affect outcomes

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

Description

Due to our location the Virgin Islands is subject to hurricanes which can hinder research projects. The

local economy can also have a negative influence on state appropriations to the university.

21. Evaluation studies planned

- Retrospective (post program)

Description

Feedback will be obtained from discussions with local farmers either as part of informal meetings or formal meetings (Framers Advisory Board, Special Listening Sessions)

22. Data Collection Methods

- Other (informal discussions)

Description

Information obtained through informal discussions with farmers during tours, field days, farm visits or the agricultural fair.