Virgin Islands AGRICULTURE & FOOD FAIR

A Tradition of Agricultural Excellence

Agriculture & Environmental Conservation Make Sense

FEBRUARY 13 - 15, 1993

St. Croix, U.S. Virgin Islands

Bulletin Number 7

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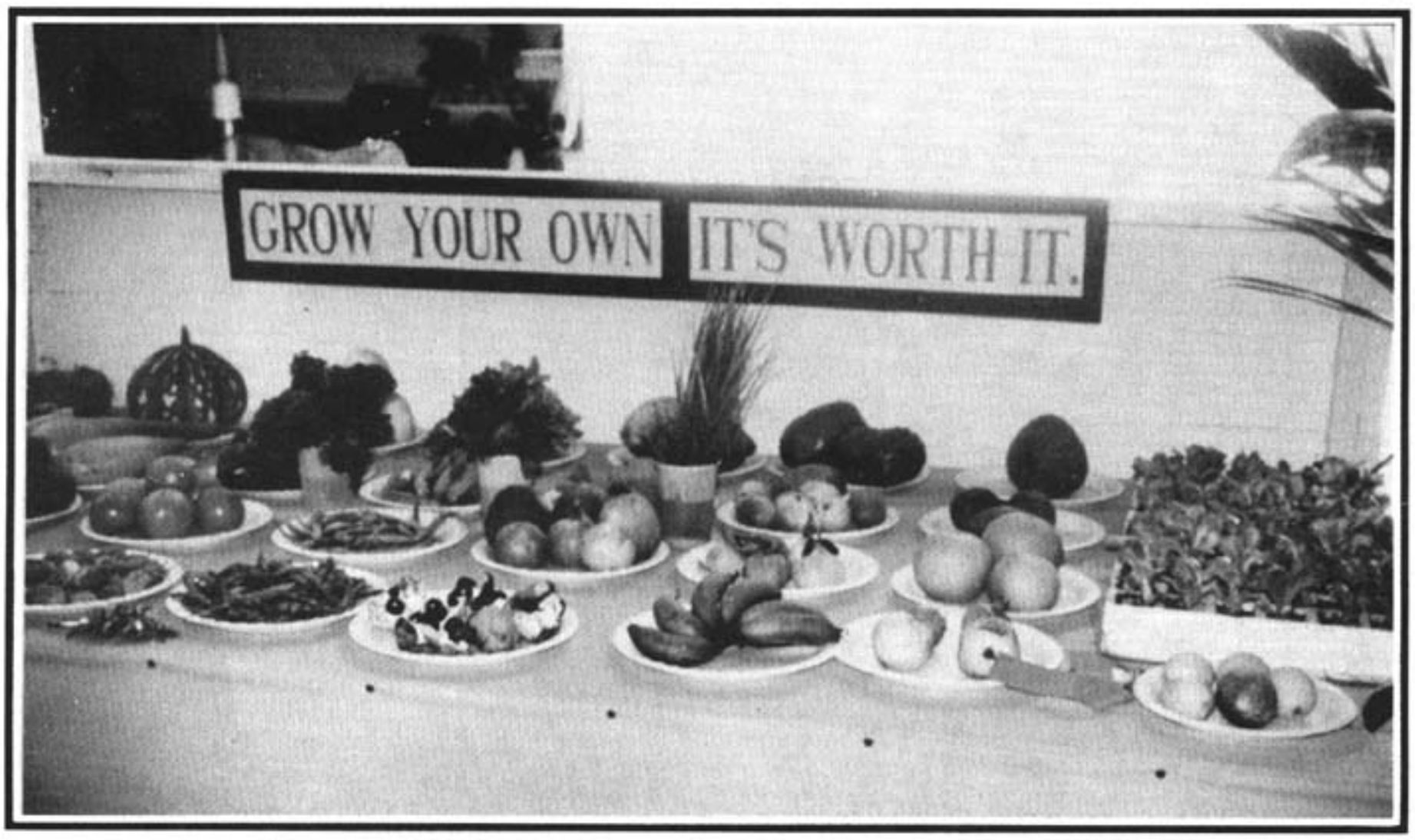
"Agriculture and Environmental Conservation Make Sense"



Editor.....Clarice C. Clarke
Editorial Committee.....Dr. D.S. Padda, Larry Bough, Robin Sterns

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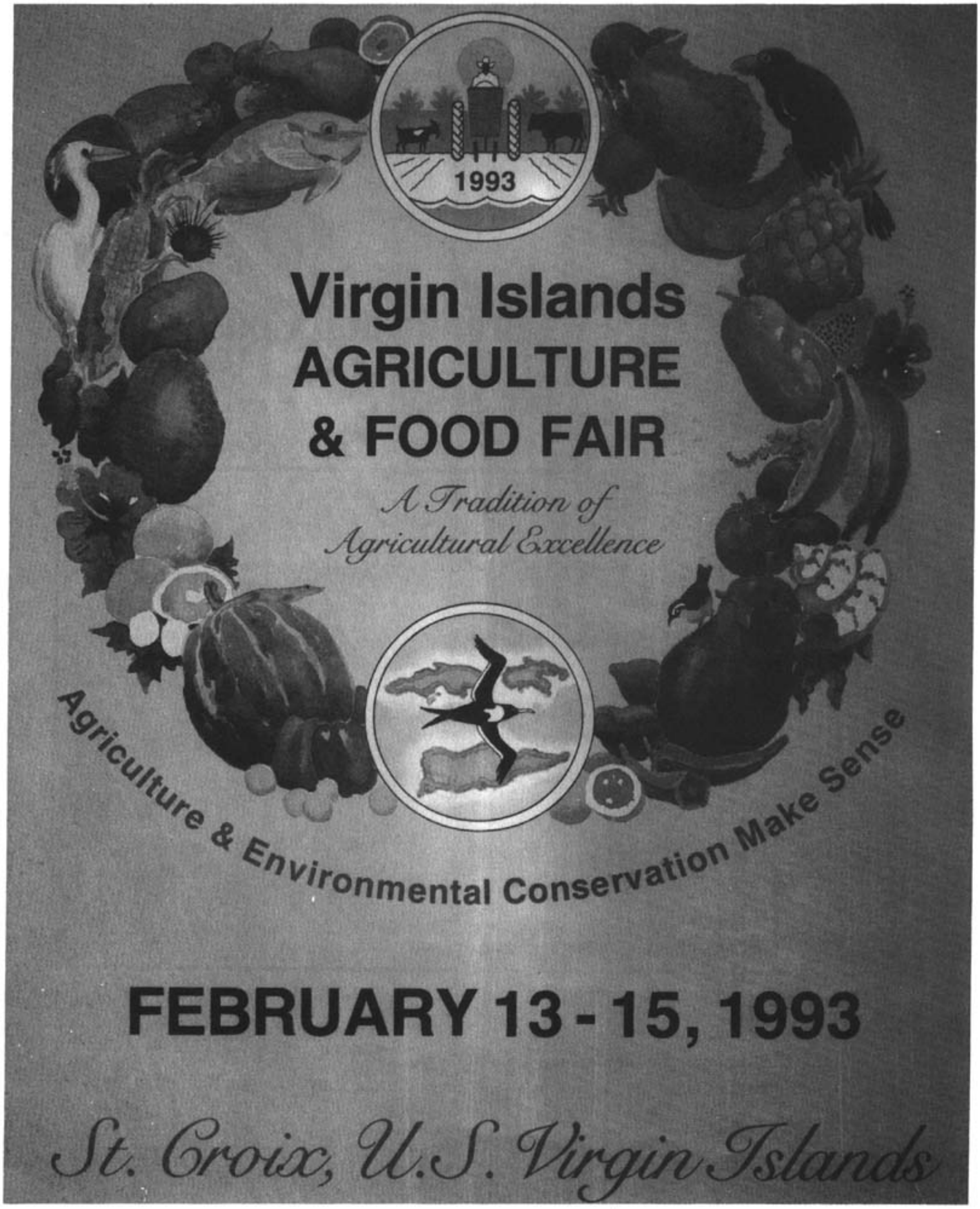

A Publication of the 22nd Annual Virgin Islands Agriculture and Food Fair

1993

Bulletin Number 7

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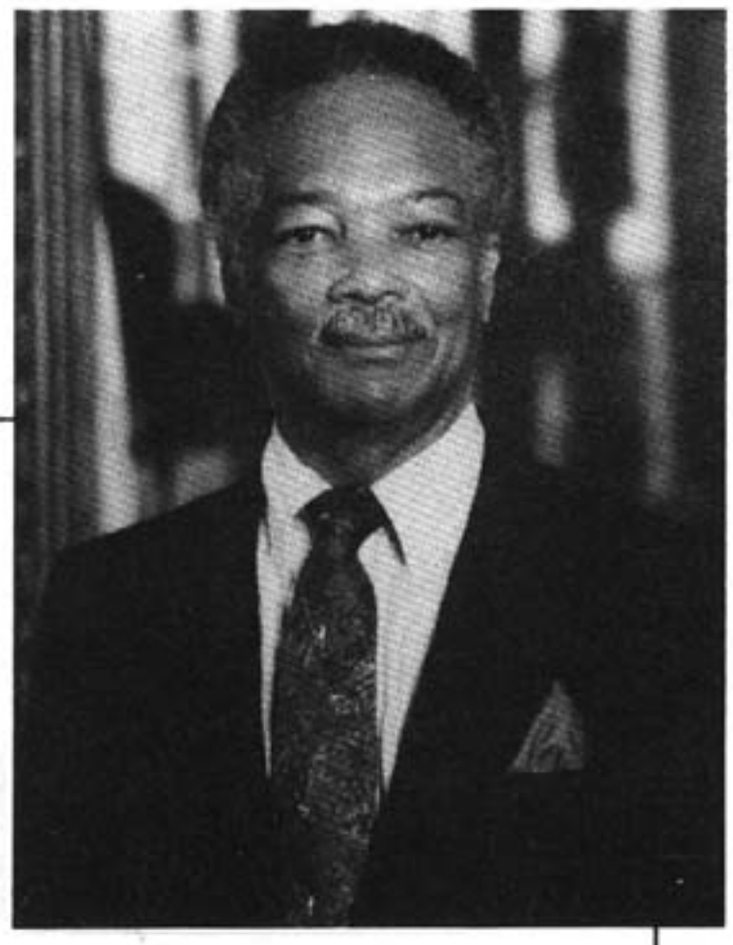


ALEXANDER A. FARRELLY
GOVERNOR

This year marks the 22nd anniversary of the Agriculture and Food Fair of the U.S. Virgin Islands. With its long record of fine achievements, there is every confidence the 1993 Agricultural and Food Fair will be a great success.

For the first time, an invitation to take part was extended to the Dominican Republic. Their delegation joins veterans from Tortola, St. Kitts, Antigua, Dominica, St. Eustacia, and the U.S. Virgin Islands.

The fair theme, "Agricultural and Environmental Conservation Make Sense," points towards a new future of enhanced Caribbean agricultural development through use of technological advances geared toward making the industry thrive and increase productivity per unit of land utilized.

In a time when less land is under production and fewer people work in agriculture, it is gratifying to know that much is being done to augment our agricultural output and to dampen our reliance on an import-dependent structure which fosters our consumption of canned foods. As we encourage investment in the industry, through events like this fair, we can stimulate the growth of our agricultural sector and make the region a tropical paradise.

On behalf of the people of the Virgin Islands, Joan and I extend our very best wishes and send warm congratulations to the fair participants and organizers. We laud their efforts to promote our agricultural development and independence.

Message from Dr. Orville Kean
President, University of the Virgin Islands

It is my pleasure to welcome you to the 1993 Agriculture and Food Fair. Please take note of the theme of this year's fair, **"Agriculture and Environmental Conservation Make Sense,"** as this idea is central to the University of the Virgin Islands and its relationship to our community.

Agriculture is both a business and a responsibility: farmers must not only consider the most profitable and efficient way to run their agribusiness, but they need to consider as well the effect their actions have on the environment and our scarce natural resources. Both these areas have been the special concern of UVI, as our researchers research the latest information on varieties and production techniques and our extensionists pass along that information to growers.

Environmental conservation affects all Virgin Islanders, as well, as tourism depends on the preservation of the natural splendor of our islands. And even if no tourist ever graced our shores from this day forward, we owe to ourselves and our children the promise of clean water, clean air, and a healthy environment.

Please enjoy the fair, and enjoy and learn from the articles contained in this bulletin. I wish to congratulate the Agriculture and Food Fair Board for another dedicated effort at providing a meaningful community event for all the people of the Virgin Islands.

Orville Kean

Orville Kean, Ph.D.
President

The Virgin Islands of the United States
Department of Economic Development & Agriculture
P.O.Box 6400, Charlotte Amalie, St.Thomas 00804
(809) 774-8784
FAX - (809) 774-4390

"AGRICULTURE AND ENVIRONMENTAL AWARENESS MAKE SENSE"

The acts of destroying the environment and depending on the same environment to yield agricultural products are directly contradictory to one another. For many years, the inhabitants of Planet Earth have taken the environment fop granted by failing to conserve and to regulate the use of our precious resources. We have injected harmful chemicals into the rivers and streams around the world to include the United States, and today we are paying the price with certain food items too contaminated for human consumption. Many farms throughout the world are inundated with pesticides and herbicides which have been proven to be harmful and detrimental to human beings. The task of reversing the harm is tremendous and perhaps beyond the financial capability of many countries. This then causes food shortages because it eliminates certain foods from the market for food consumption.

The human suffering in many parts of the African continent today is a direct result of the lack of environmental conservation of the natural resources. Fertile lands have become deserts which are unable to yield food for the inhabitants.

We have so much to learn about the subject of conservation of our environmental resources. We can look at other countries which have squandered their resources, and try not to emulate such practices. We in the U.S. Virgin Islands possess the skills, knowledge and determination not to squander our resources, and we must be ever vigilant to avoid the mistakes of the past.

"Agriculture and Environmental Conservation Make Sense."

My very best wishes to all of the faithful participants and a very supportive community.

Sincerely,

Eric E. Dawson

Eric E. Dawson, Esq.
Commissioner

Environmental Issues are Central to UVI'S Land-Grant Component

By
Dr. Darshan S. Padda
Vice President for Research and Land-Grant Affairs
University of the Virgin Islands

The theme of this year's Agriculture and Food Fair recognizes the relationships among people, agriculture and the environment. The same is true of the University of the Virgin Islands' Land-Grant component, which is dedicating its efforts to conducting research into the areas of science that help protect and preserve our fragile natural resources and then passing that information along to the people of the Virgin Islands.

In his 1992 book on the future of our planet, Earth in the Balance (Houghton Mifflin Co., Boston), Vice President Al Gore outlines a world-wide cooperative plan calling for the increased use of a number of new, environmentally appropriate agricultural technologies. These include:

(1) refinements in irrigation technology that reduce water consumption while increasing yields,

(2) low-input crop management to reduce soil erosion,

(3) advances in plant genetics to introduce natural resistance to diseases and predators while reducing pesticide and herbicide uses,

(4) new discoveries in aquaculture and fishing techniques to offer alternatives to destructive practices, and

(5) more sophisticated techniques of food distribution to reduce costs and losses during distribution, especially among less developed nations (p. 322).

The Vice President also decries the steady loss of genetic diversity in a number of important food crops around the world, noting that every plant and animal on our planet fights off extinction through the genetic ability to respond to changes in its environment. He adds that The United Nations International Board for Plant Genetic Resources lists the most at-risk fruits and vegetables, including avocado, cassava, coconut, mango, okra, pepper, sorghum, sugarcane, sweet potato, tomato and yam (p. 137).

The University of the Virgin Islands Agricultural Experiment Station is already actively responding to these global needs, by the following:

(1) conducting studies into the responses of various crops to water-conserving irrigation systems,

(2) testing many varieties of fruits and vegetables, including most of those on the United Nations "at-risk" list, for their viability in semi-arid climates around the world,

(3) seeking and studying plant varieties that are naturally disease- and insect-resistant, for example strains of papaya that are naturally resistant to the extremely damaging effects of papaya decline disease, which threatened the Virgin Islands for years,

(4) promoting an inexpensive, dependable and environmentally responsible source of protein through aquaculture,

(5) fighting erosion and species loss through reforestation,

(6) improving the quality of feed available to local animal species; and

(7) improving the animals themselves, to the benefit of all consumers.

The UVI Cooperative Extension Service has also responded to these needs, by the following:

(1) promoting environmental responsibility and awareness to its clientele,

(2) emphasizing natural resources,

(3) teaching safe and limited use of pesticides while offering natural alternatives whenever possible, including the use of Integrated Pest Management to provide a multi-discipline approach to plant protection,

(4) producing publications like "The Leatherback Turtle" and "Virgin Islands Birdlife," which teach Virgin Islanders about rare and endangered local species, and

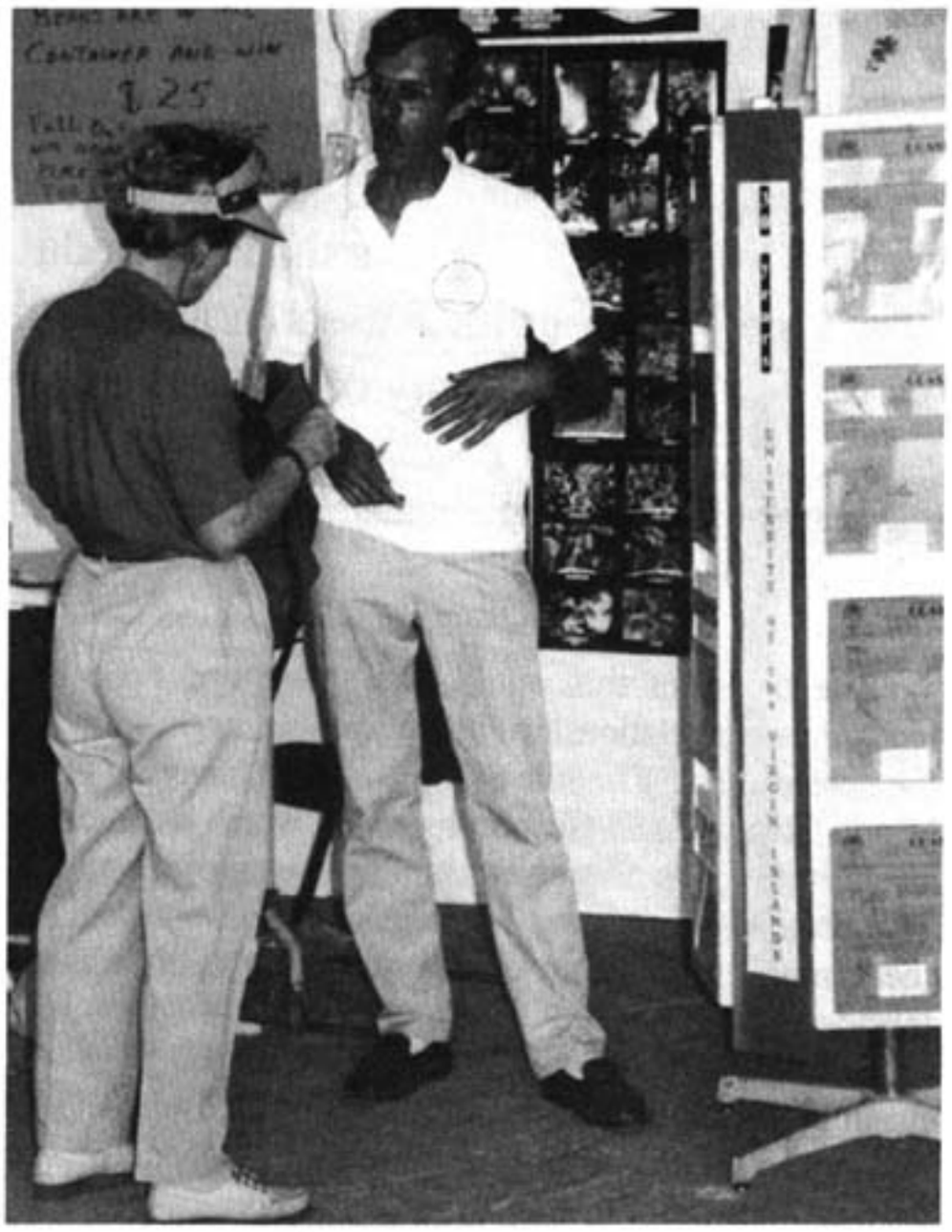
(5) passing along the research results of AES experiments conducted at UVI and at other similar institutions to the people.

CES staff have made a particular effort to encourage the increased use of drip irrigation among Virgin Islands home gardeners and farmers, as a way to conserve precious water supplies while increasing yields. The CES urban gardening

program assists consumers improve the quality and variety of their diet through growing their own vegetable gardens in limited spaces, while providing significant savings over imported, store-bought produce.

Finally, through its CES home economics program, which emphasizes the relationship between nutrition and health, and through the component's active involvement in the Caribbean Food Crops Society, UVI Land-Grant has already made a priority of promoting a better food source for the people of the Virgin Islands and the Caribbean.

We are a small group, and our work is just 20 years old. But we are committed to a vision of the future, committed to collaboration, and committed to excellence. We promise to redouble our efforts to improve the lives of Virgin Islanders and make our beautiful island home a paradise our future generations can inherit with pride.



UVI Land-Grant Programs Providing Educational Information at the 1992 Fair

Recordkeeping:
Valuable Management Tool or Waste of Time?

By
Sue Lakos
Extension Agent
UVI Cooperative Extension Service

No one likes to do recordkeeping. It involves a lot of time, effort and paper to do a proper job. Why, then, do good farmers spend so much time at it instead of spending their time fixing fences or building a new barn?

The bottom line in good recordkeeping is more dollar income for the farmer. By proper management of the farm livestock records, a farmer can insure that he has only healthy, productive stock in his herd and,therefore,is producing to his utmost capacity.

For example, a cattle farmer needs to know that all of his cows are bred. Cows that don't get bred for long periods of time don't produce as many calves over their lifetime as cows that get bred every year. Also, if a cow hasn't been pregnant in three years, all she is doing is eating feed (and money) without giving anything in return.

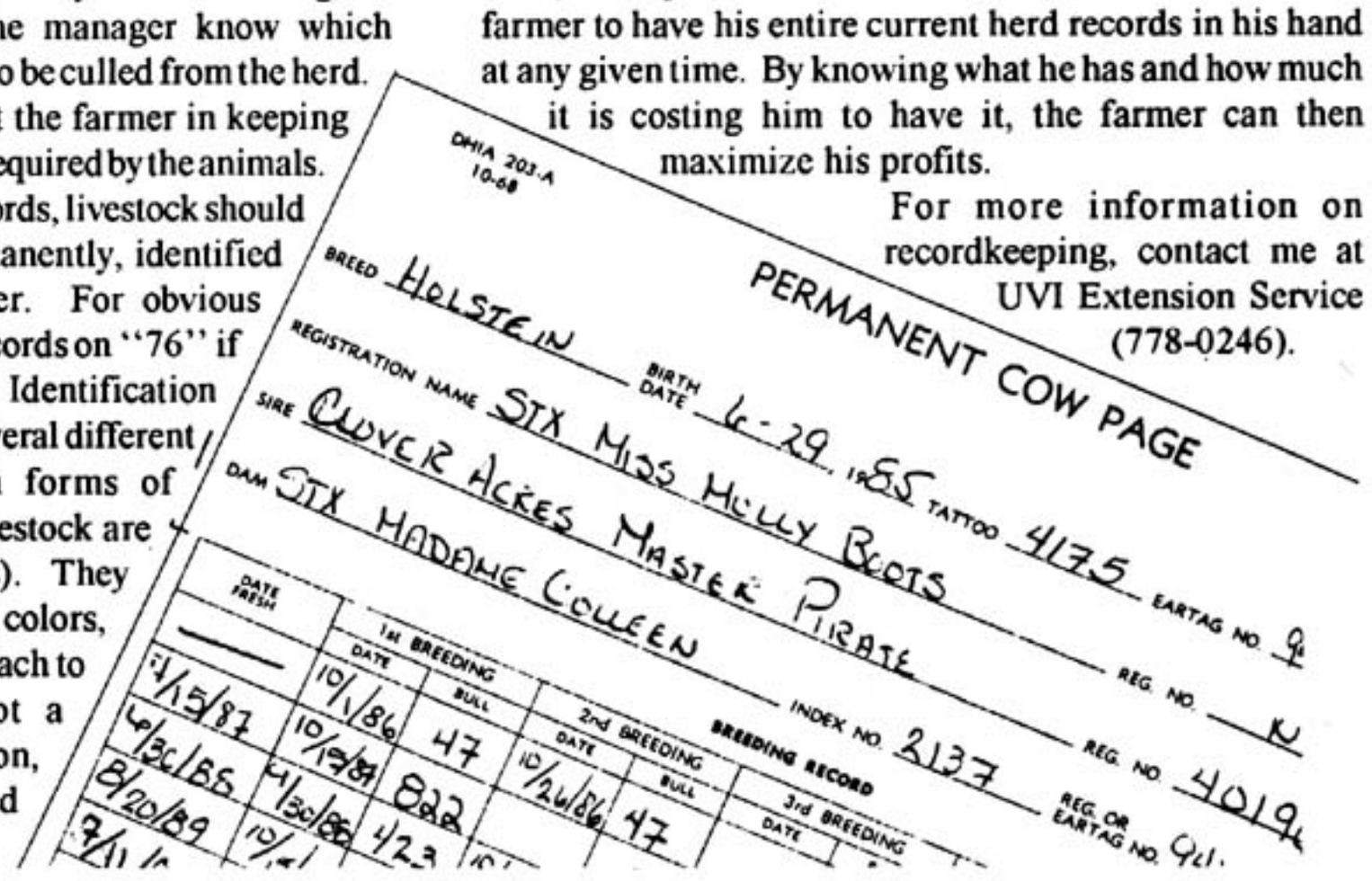
The same situation applies to the sheep, goat, or swine producer. For the "hobby farmer" this isn't important, but most serious farmers feel that a return on their investment is very important.

Another reason to keep good records is to monitor the health of the stock. Good recordkeeping allows the farm manager to keep track of vaccinations and medications given to the animals. This not only prevents the sale and/ or consumption of animals that may still have drugs in their systems, but also lets the manager know which animals get sick often and need to be culled from the herd. In addition, these records assist the farmer in keeping track of the veterinary expenses required by the animals.

In order to keep accurate records, livestock should be clearly, and preferably permanently, identified with their own unique number. For obvious reasons, you can't keep good records on "76" if there are three 76's in your herd. Identification can be accomplished through several different means. The most common forms of identification in all types of livestock are eartags or necktags (necklaces). They come in many different styles, colors, and sizes and are very easy to attach to the animal. These are not a permanent form of identification, however, as they can be removed by thieves or torn out if they get caught in fences or brush. Permanent forms of ID include tattooing of ears, lip or skin, computer chip implants under the skin, ear notching, or, in larger animals, branding (either hot or freeze). These types of identification cannot be lost or removed and remain with the animal for life.

Good recordkeeping does not require fancy equipment or a college education. It also does not require a computer or a large investment of money. Good recordkeeping does require either a 3-ring binder with loose leaf, file card box,(loose-leaf paper or file cards) pen, pencil, and a desire to better manage your livestock herd. Each animal in the herd should have its own page in the binder (or card in the box). This page should contain the animal's unique number (and name), the date of birth of the individual, the parents' identification numbers, and the records of the veterinary expenses and production or performance of that animal. That page belongs only to that animal, is placed in the binder at the time of the animal's birth and remains with the binder until that animal is removed from the herd. At that time, the page is removed from the binder. In addition, this binder or a "companion" binder can be used to hold the income and expenditures of the farm (livestock sales, feed purchases, vet bills, etc.). This allows the farmer to have his entire current herd records in his hand at any given time. By knowing what he has and how much it is costing him to have it, the farmer can then maximize his profits.

For more information on recordkeeping, contact me at UVI Extension Service (778-0246).



Restocking Nassau Groupers in the U.S. Virgin Islands

By
Callum M. Roberts and Norman J. Quinn
University of the Virgin Islands Eastern Caribbean Center

Decline of a Fine Food Fish

Fishing in the U.S. Virgin Islands was very different forty years ago. Fishermen tell stories of fabulous quantities of fish being landed with considerably less effort than people put into catching fish today. This is especially true where the Nassau grouper is concerned. Nassau groupers once formed the biggest part of the catch in Puerto Rico. By 1980 they had dropped to fourth place, and now there are so few caught that they hardly figure in catches at all. The picture is just as bleak in the U.S. Virgin Islands.

Why Nassau Grouper?

Although the Nassau grouper is not the only species to have suffered serious declines in the Virgin Islands over the past few decades, it has been hit the hardest. What has marked this species for the spectacular drop in numbers? Nassau groupers have been called the lions or tigers of the reef. They are voracious predators, feeding opportunistically on smaller fishes and shellfish. This also makes them easy to catch with hook and line and baited traps. Other fishes from the grouper family, like the Red Hind, share this characteristic, yet are still comparatively common. The Nassau grouper differs in one important respect: its breeding aggregations.

Once a year, around the time of the full moon in January, Nassau groupers gather at a few special sites (known as spawning aggregations) to reproduce. Perhaps tens of thousands of fish would gather at each site to breed in one of the most amazing spectacles in nature. Fishes will travel many miles to reach these sites and some, carrying tags, have been recorded to swim over sixty miles.

It didn't take amateur or professional fishermen, long to realise that on these spawning aggregations lay a feast for the taking.

The temptation to make fast money from Nassau groupers proved too great to resist. During the spawning season, aggregation sites would be literally strip-mined. While boats ferried catches to the shore others took their place to fill another set of traps in a constant shuttle lasting the duration of the season. Many fish would be wasted when catches saturated the market. Joe LaPlace, a well-known St. Thomas fisherman, recalls how with such an abundance of fish people just couldn't believe that they would ever run out.

Cleaning out a spawning aggregation means much more than simply fishing the small area of the aggregation site itself. It means removing most of the Nassau groupers from reefs. In simple terms it is a highly efficient way of catching a fish: much too efficient. It didn't take many years before catches began to fall, then to plummet. Although other groupers also spawn in aggregations, none has a short a breeding season or such specific sites. Consequently, fishermen have not been able to catch them so easily. However, all of these fishes are now beginning to show alarming declines, and if we are not careful they may follow the fate of the Nassau grouper.

Halting the Disappearance

Lawmakers act to protect fish stocks after collecting enough information to see what is the best management plan. Sometimes this is slower than ideal. By the time laws had been passed to protect spawning aggregation sites (in 1985), the Nassau grouper had almost become history in the U.S. Virgin Islands. This sorry state of affairs is not unique to the territory. The once common Nassau grouper has become rare throughout much of the eastern Caribbean and Bermuda. Even in areas which have been less heavily fished, such as Belize, their spawning aggregations have been decimated.

Faced with this problem people began to wonder what they could do. As this fish were so well-liked for theirs flesh, growing them in captivity, aquaculture, seemed like a good move. The Agricultural Experiment Station (AES) of the University of the Virgin Islands in St. Croix initiated studies on the fish in the Cayman Islands as part of a technical assistance project. According to Dr. James Rakocy, AES Associate Director, the grouper project was to become part of a sea farm park, a mariculture research and education center. However, Hurricane Hugo and subsequent difficulties sidelined the project.

From the very beginning, attempts to grow the groupers from eggs and to restock local populations by releasing large numbers of juvenile fish into the sea were the main objective.

The aquaculture project was taken up by Dr John Tucker of the Harbor Branch Oceanographic Institution in Florida. He succeeded in raising fish from eggs collected in the Cayman Islands in 1990. Having shown that the groupers could be raised in captivity, the next step was to test whether they could survive in the wild.

Originally it was hoped that a small number of fish could be released in the Buck Island National Park in St. Croix with the collaboration of the Virgin Islands Division ofFish and Wildlife. However, bureacratic red tape prevented this and the project was bounced across to the Eastern Caribbean Center of the University of the Virgin Islands in St Thomas. With financial support from the University of Puerto Rico Sea Grant College Program, and Harbor Branch, and the encouragement of the Department of Planning and Natural Resources, the project was approved. Twenty nine fish weighing 1-3 pounds and measuring 12-15 inches were to be flown from Florida to St. Thomas for release at Saba Island.

To prepare fish for the transition from captivity to the wild, John Tucker had been putting them through a "training program" for six months. They had been moved from a diet of pelleted food to live fish, shrimp and crabs, and their reflexes had been sharpened by being chased around their tank by people splashing the surface.

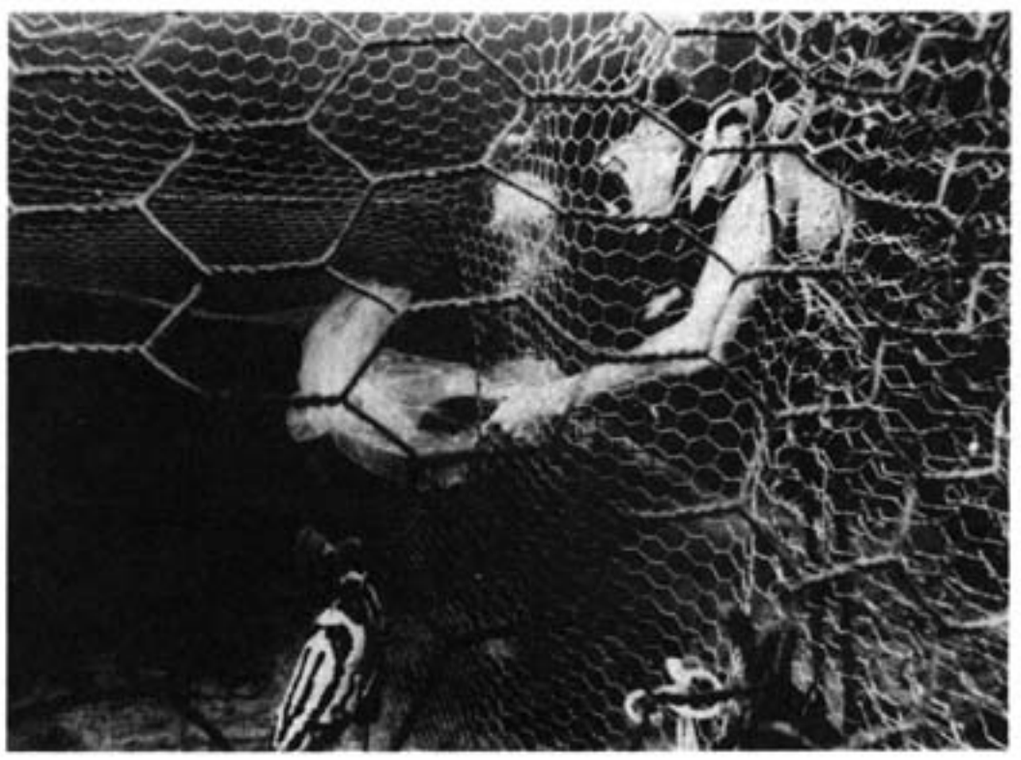
In St. Thomas, we had been preparing for their arrival. Expecting that the 17-hour journey from Florida would be very stressful we constructed a large underwater cage with the help of local fisherman David Berry.

The fish arrived early in September and were whisked from airport to sea within an hour. In the cage they were offered a variety of food daily until they began to feed normally. Two weeks after arrival, 27 fish were released from the cage to begin independent life (two had died), the first time that hatchery-reared Nassau groupers have been released into the sea anywhere in the world.

Arrival of groupers from Miami.

Within hours of release we were delighted to see that the fish had all found shelter under rocks or ledges and were being cleaned by cleaning gobies. What was most remarkable was that they had never encountered these gobies before but were allowing them into their mouths and gills just like wild fish would. Over the following week the fish were watched closely as they learned to live on the open reef. One fish was even seen following an octopus while it was hunting, a behavior common in wild groupers which takes advantage of prey being disturbed by the octopus.

Since their release, movements of the fish have been followed closely. Each carries a numbered orange tag close to the dorsal fin allowing us to identify them. Every few weeks the reef around the point of release is searched with the help of students of the UVI MacLean Marine Science Center. Remarkably, many of the fish appear to have settled in to life on this reef, allowing us to monitor their survival. Nevertheless, within a week one was reported from Buck Island seven miles away.



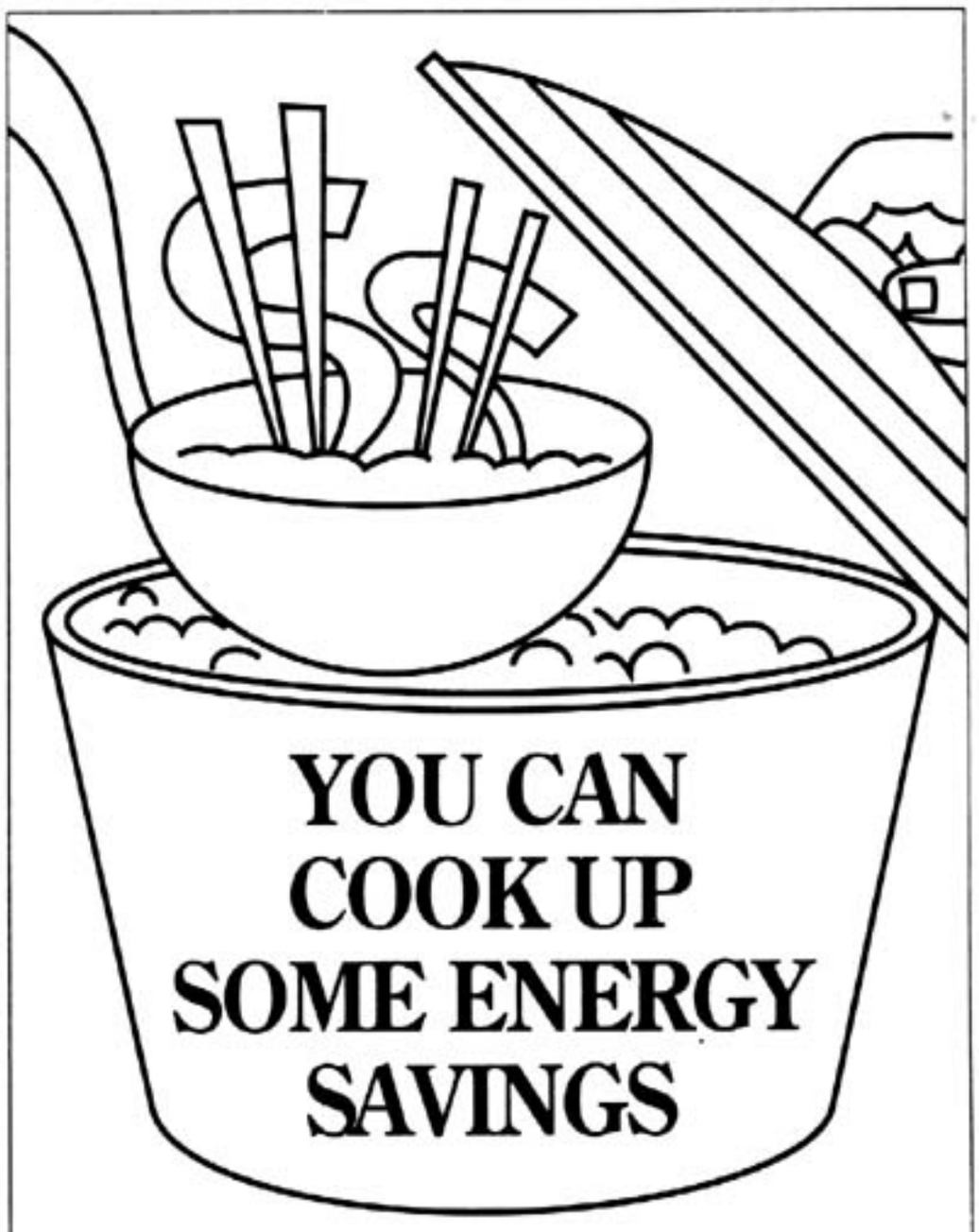
Divers transfered the groupers to the underwater cage at Saba Island.

If releasing Nassau groupers is going to be a successful way of restocking depleted populations, we need to know whether they are able to survive in the wild and whether they will breed when they become sexually mature. At present the fish we released probably have another couple of years before reaching maturity. The release of 27 fish is not in itself going to restore Nassau groupers around the U.S. Virgin Islands. However, we hope that this pilot study will tell us whether large-scale releases of thousands of juvenile fishes have any chance of success.

The sea is large and to be successful in following the fate of these fish we are seeking the help of fishermen and the general public. Please let us know if you see a tagged Nassau grouper, and please let it go if you have caught one (call us at 779- 6103). We need this information to tell how far the fish are moving and how long they live.

Dr. LaVerne Ragster, Director of the Eastern Caribbean

Center, stresses that while this project is exploring the possibility of lending a helping hand to the beleaguered Nassau grouper, such technical fixes should not be seen as a substitute for sound management of marine life. Recovery of wild populations through careful stewardship probably remains the best chance for this and other species in the waters of the U.S. Virgin Islands.



YOU CAN COOK UP SOME ENERGY SAVINGS

You can cut your cooking costs and whip up some energy and cost savings right in your kitchen. Here's some easy ways to do so:

1) Use the smallest appliances possible — such as slow cookers, electric grills, and toasters — because they use less energy than a conventional stove or oven.
2) Cover pots and pans to allow food to cook faster.
3) Keep your oven and burners clean to operate at their most efficient.
4) Avoid opening the oven door to peek at what's cooking.
5) Cool food before putting it in the refrigerator or freezer.
6) Thaw frozen foods in the refrigerator before cooking.
7) Think about what you want to remove from the refrigerator before you open the door.

VIRGIN ISLANDS WATER AND POWER AUTHORITY

Releafing Paradise

By
Robin Freeman
Executive Director
St. Croix Environmental Association

The St. Croix Environmental Association (SEA) runs a program called V.I. ReLeaf, which is the territorial coordinator for Global ReLeaf. Global ReLeaf is an international organization devoted to the reforestation of our planet and, likewise, V.I. ReLeaf is dedicated to the reforestation of our islands.

V.I. ReLeaf was formed in the aftermath of Hurricane Hugo, a reaction to the massive loss of trees we incurred. A number of caring individuals donated money to SEA with the message: "Please help do something about the loss of trees."

The first project V.I. ReLeaf undertook was a public education campaign to let people know why it is so important that together we replant the islands. As we all know, trees provide much-needed shade, they beautify our yards and neighborhoods, help purify the air we breath in converting carbon dioxide to oxygen, and provide habitat for wildlife. There are a myriad of other benefits provided by trees including the edible treats they produce.

Tree distributions were the next phase in the V.I. ReLeaf program. In conjunction with Cruzan Gardens and Grange Hill Nursery, trees were made available to all religious organizations at a discounted price. Together with St. George Botannical Gardens, V.I. ReLeaf gave away agave plants.

In early 1990, SEA was contacted by the U.S. District Court to see if we could provide community service work for people in lieu of their serving jail time. Thus began V.I. ReLeaf's most ambitious program--building greenhouses at public schools. With the broad-based support of the local business community, a V.I. government grant and a great deal of community service and volunteer manhours, V.I. ReLeaf met its goal of building four greenhouses and has gone on to begin construction of two more with plans to build yet another two.

Those schools with completed greenhouses include Central, Woodson, Ricardo Richards and Alexander Henderson. With the exception of Henderson, planting activites are underway. The greenhouses are, of course, property of the school and can be used how they see fit, but V.I. ReLeaf encourages the propagation of trees of all kinds and schools have been very amenable to this idea. Greenhouses will be located at Elena Christian, Alfredo Andrews, Evelyn Willliams and possibly Pearl B. Larson.

One of the major stumbling blocks incurred by V.I. ReLeaf in this project was a source of water which is needed in large quantities by fledgling plants. Also, unless schools already have an agriculture program, it is difficult for them to incorporate planting projects into the curriculum. These problems are being overcome thanks to a grant from the Anti-Litter and Beautification Commission. Funds have been provided for water buffaloes and for a part-time greenhouse coordinator who works with teachers and administrators at each site to help them make the most of and grow the most in their greenhouses.

One emphasis is making and using compost. A compost bin is built at each greenhouse and school cafeterias are enouraged to separate vegetable and fruit scraps, excellent ingredients of compost. In this way, less "garbage" will end up in the landfill and valuable nutrients will be returned to Mother Earth in the form of organic hummus.

Another project undertaken by V.I. ReLeaf was the planting of a "Model Site" with funding provided by Global ReLeaf and Aveda Corporation. Applications were solicited from neighborhood associations which were required to help plant and care for the trees. Grant monies were used to purchase trees, topsoil and stakes.

Calquohoun was the neighborhood selected as the Model Site and residents turned out en masse, complete with two backhoes and a watering rig, to plant 25 15-foot mahogany, cedar, black olive and other trees. The next time you are on Midland Road in Calquohoun take note of the beautiful and healthy young trees growing around the bus shanties. V.I. ReLeaf has applied for funds to plant another "Model Site" -- look for notices in the paper and on TV. Your neighborhood could be the recipient of trees.

Last but not least, an innovative project taken on by V.I. ReLeaf in cooperation with St. Croix Dairy Products was the printing of the V.I. ReLeaf logo on 1/2-gallon milk cartons with a message urging people to use the carton as a container in which to start a tree seedling. This served the dual purpose of encouraging people to think in terms of reusing an item rather than immediately throwing it away and gave them incentive to start seedlings. SEA requested that people bring us their empty cartons for use in the greenhouses and the response was overwhelming --an indication that people are very eager to recycle and willing to help in reforestation efforts.

When your thoughts next turn to planting, consider planting trees in addition to vegetables and ornamentals. Drought resistant species will thrive on the east end and just about any tree will thrive in our rainforest. Plant trees for yourself, the planet and future generations.

V.I. ReLeaf

Improved Vegetable Seedling Production

By
Errol Chichester
Horticulturist
V.I. Department of Economic Development and Agriculture

Seedlings producted under greenhouse conditions

Anyone who has tried to grow vegetables in his or her backyard or garden knows that water is the main limiting factor in vegetable production. Since most of us depend on rainfall for crop irrigation, it is imperative that vegetable growers start off with strong, healthy seedlings that will withstand dry conditions until water is available.

Thus, in an effort to assist and encourage farmers and gardeners to increase production, the Division of Agriculture has moved to improve and increase seedling production to meet the needs of the farming community. To accomplish this, the division has shifted to a new and more efficient method of seedling production. The mortality rate of transplants has declined drastically, and farmers are very satisfied.

In the old system of seedling production, seeds were sown directly on the ground on raised beds without initial shade. This system had many problems as the seedlings were more susceptible to soil disease such as "damping off," insect damage and trampling by heavy rains. Most significantly, however, is that these seedlings had to be pulled or dug from the soil, which meant a farmer could get over 25 seedlings in a clump of soil the size of the palm of his hand. Upon time of transplanting, the seedlings had to be separated individually. This resulted in damaged roots and in seedlings with little or no soil attached to their roots. These bare-rooted seedlings undergo shock when planted, which, if severe enough, may result in poor establishment and growth, delayed and uneven maturity, and a reduction in yield, even if water is immediately available. However, if no water is available at time of planting, the majority of seedlings will perish within hours.

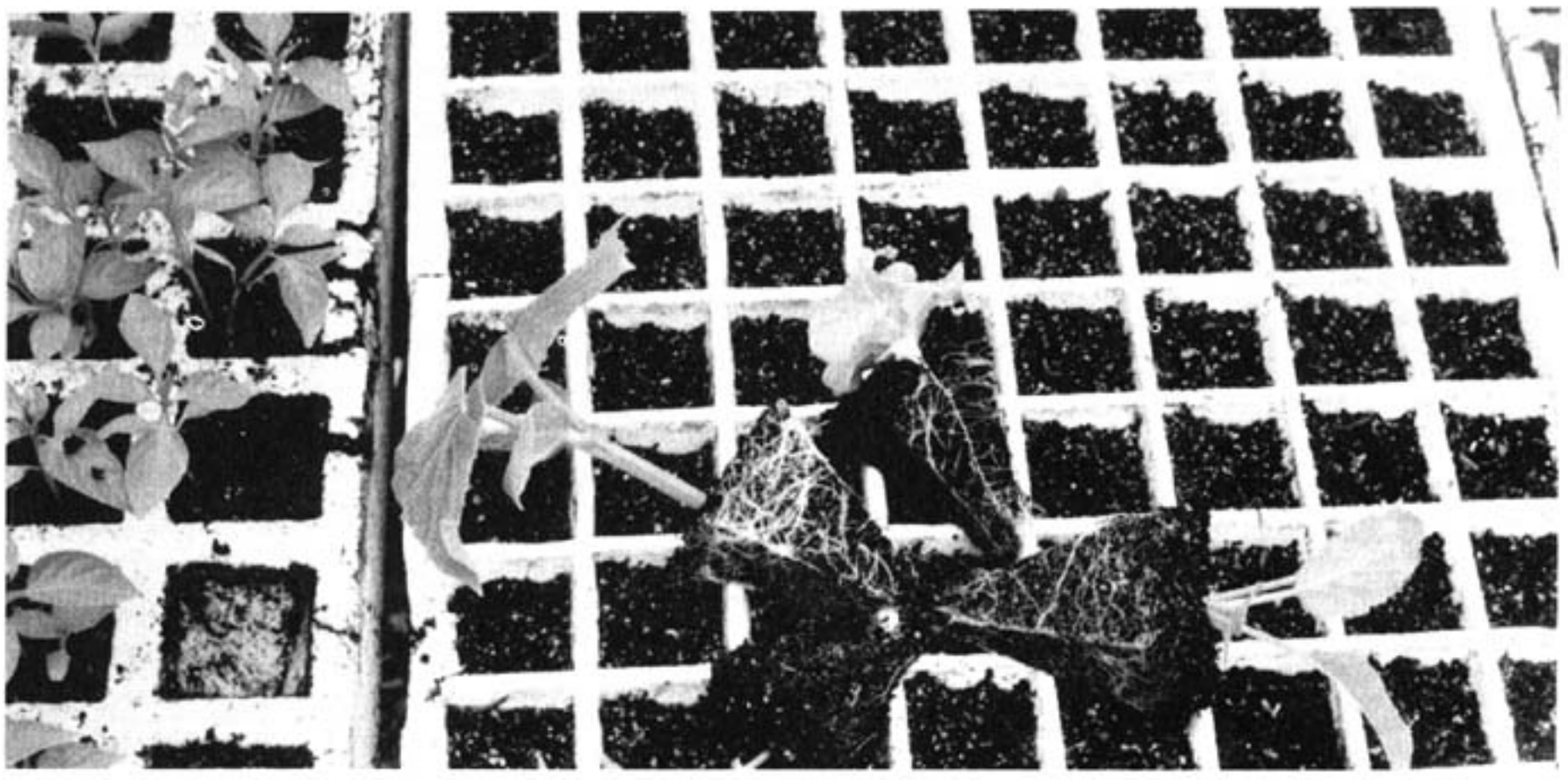
Clumps of seedlings taken from the ground.

With the new system of vegetable seedling production, seedlings are grown in a shaded greenhouse in styrofoam trays, each in its individual slot or square. Trays consisting

of 72 or 128 squares are filled with a soilless media and placed on racks. The irrigation/fertilization system consists of a pressure tank, fertilizer tank, a timer and solenoid valves which allow for automatic irrigation. As seedlings are needed, they are pulled from their individual square with roots and rooting medium intact. At planting, the seedlings are placed in the ground with their own clump of soil and may survive up to three days without water. Their roots are not disturbed, resulting in healthier, more quickly-established plants, and a more uniform crop.

This new system has been well received by farmers and gardeners who frequent the agriculture station to purchase seedlings even during dry periods. The success of this method of seedling production has caused department officials to consider building another greenhouse to meet the increasing demand for vegetable seedlings. With the implementation of the University of the Virgin Islands Extension Service Urban Gardening Program, the increasing demand for seedlings and the need for more vegetable production, such an addition is highly justified

Seedlings produced outdoors.



Seedlings in their individual cube or soil from tray in greenhouse.

Working to Secure our Children's Future

By
Robin Freeman
Executive Director
St. Croix Environmental Association (SEA)

Many people by now have heard of the St. Croix Environmental Association (SEA), but a lot do not know exactly what the organization is all about. First and foremost, it is about preserving the natural beauty and biological diversity of our wonderful island for enjoyment and use now and for generations to come.

SEA is a non-profit, primarily volunteer organization, which means the majority of our support, both financial and labor, comes from our membership. Anyone can be a member simply by filling out a form and paying annual dues. Membership entitles you to attend our many field trips, movies and lectures free, a discount in our shop, and a bi-monthly newsletter. It is important to note that SEA is not a government organization.

SEA is a chapter of the Virgin Islands Conservation Society and has a sister chapter - the Environmental Association of St. Thomas/St. John (EAST). The St. Croix chapter emerged as a separate entity in 1986 in response to the proliferation of developments then being proposed for this island.

Some people feel SEA is anti-development; in fact, the organization supports planned development which takes into consideration, among other things, the environmental integrity of our surroundings. SEA firmly believes that people should and must learn to coexist--to share the earth and the island--with other living things.

Developments SEA has opposed are those which are planned for sites of the island that have been designated by the V.I. government as "Areas of Particular Concern/ Areas for Preservation or Restoration" or "Significant Natural Areas." Scientific studies have been conducted and it has been determined that these areas, such as Salt River, Jack's Bay, and Southgate Pond, are extremely environmentally sensitive. Yet, no steps have been taken to assure their preservation.

Aside from its important conservation work, SEA has been very active in education. The current emphasis is on teacher training workshops with the goal being to empower teachers with local environmental knowledge they can take back to their classrooms. The workshops are taught on location at various ecosystems of the island in the hopes that teachers will conduct field trips to these special places with their classes. SEA also maintains a video, periodical and newspaper archive library to aid in research projects.

SEA has also made major strides in recycling efforts facilitating the island-wide voluntary aluminum can collections. This action team also reached hundreds of school children with its anti-litter message using a video and the Litter Critter to spread the word.

The territory coordinator of Global ReLeaf is dedicated to the replanting of trees on the islands. V.I. ReLeaf was formed in reaction to the devastation Hugo wreaked to our trees, and projects have included public education of the importance of trees, tree distributions and the planting of a "Model Site." Through the joint efforts of the Calquohoun neighbors and SEA volunteers, 25 fifteen-foot trees were planted to beautify and provide more shade for the area, which serves as a Model Site to inspire other neighborhoods to plant trees. SEA hopes to plant another Model Site in the near future - look for announcements to involve your neighborhood. Another ambitious program of SEA is V.I. Releaf. (See related story).

If you would like to get involved in the efforts to conserve the beauty and bounty which nature has provided, and which is disappearing before our eyes, please call SEA at 773-1989. Everybody's help is needed --your help is needed.

Range Ecology

By
Olasee Davis
Extension Specialist-Natural Resources
UVI Cooperative Extension Service

In order for Virgin Islands livestock farmers to have good productive rangeland for animal production, they must understand range ecology, or how plants interact with animals, soil, climate and the physical environment. Most Virgin Islands pasturelands are overgrazed because of the lack of understanding of range ecology. To increase forage production on Virgin Islands pastureland, livestock farmers must know something about their range plants and how they function in the environment.

Plant Succession on Pastureland

The process of plant succession on pastureland in the Virgin Islands is influenced by rainfall, soil type, climate and how different plant species replace each another. For example, most Virgin Islands pastureland is dominated by guinea grass (Panicum maximum). But when the pastures are overgrazed by livestock, hurricane grass (Bothriochloa pertusa), is a undesirable grass for animals, takes over the pasture along with other weed pests.

Succession results from a change in habitat and invasion of new plant species. Change of pastureland or habitat results in a change of plant cover adapted to the area. Change in habitat reaction sometimes results from the action of range plants upon the soil and microclimate. Thus, succession may be either natural or induced. However, for livestock farmers to manage their pasture properly, they have to know when to rotate their animals in order to maintain a good stand of grass. In rangeland management, pastures are judged by plants called "increasers," "decreases" and "invaders."

Increaser

Plants that grow well in pastures with moderate grazing and favorable weather conditions are called increasers. For example, guinea grass is an increaser once there is not much grazing pressure on the grass by animals. However, as grazing pressure increases or as range condition reaches fair condition, these species will decline. Therefore, local livestock farmers have to rotate livestock when necessary to have a continuous supply of forage.

Decreases

Decreases are the plants that result when range plants or grasses are grazed too close to the soil so that livestock may end up feeding on undesirable plants. Grasses that decline because of too much grazing pressure by animals are examples. Continued heavy grazing on pastures without rotating animals deteriorates the rangeland. As grazing continues the land approaches a barren state, as with so many pastures in the Virgin Islands.

Invaders

Invaders are species that encroach onto pastureland because the desirable species are grazed out by livestock. An undesirable plant such as Casha (*Acacia spp.*), which dominates most of the Virgin Islands pasturelands is a good example of poor pasture management.

Plant Ecology in Relation to Soil

Soil is another factor in range ecology management. Soil is a product of the action of climate and vegetation upon parent materials. Improper grazing influences the soils' ability to support plants. Many pasture soils in the Virgin Islands are lost by the washing and blowing of rain and wind because there is little vegetation to protect the surface.

As soil becomes less abundant and increasingly compacted with misuse of the land, decreased water infiltration and increased runoff are inevitable. As vegetations are removed, erosion becomes a major problem for local farmers. The way to protect soil is to prevent the pasture from being overgrazed.

Climate Impact on Pastureland

Range ecosystems are dynamic and changing continuously. Thus, it is important for farmers to understand these changes and which ones influence management decisions. Climate has a major influence on plant growth in the Virgin Islands. The topography and soil type determine species

adaptation to the area. Because rainfall is not distributed evenly throughout the islands, the growth pattern of range plant is not the same in all areas.

For example, the southeast and eastern sides of St. Croix do not get much rain annually. In these regions, farmers have to manage their pastures according to the environmental condition. On the northern side of the island, however, the rainfall is much higher. So farming management practices are some what different.

The Influence of Animals on the Physical Environment

Animals have a major impact on the physical environment and the plant communities with which they are associated, and as a result, can affect range improvement activities in diverse ways. In the Virgin Islands, some pasturelands are on flat lands while others might be rolling hills and still others are on steep slopes.

Depending on the activity of the animals, these impacts can be beneficial, detrimental, or both. Animals such as goats or cattle influence ecosystem processes such as nutrient and water cycling that are basic requirements for plant growth and development. Successional patterns also affect animals behavior by regulating competition, development and productivity among individual plant species and communities of plants.

Without control there can be no management. The four basic areas of control in range ecology are:

1. Control of space or how much area is to be grazed. This is done with fences, either permanent or temporary.

2. Control of time. How long the area is to be grazed or rested.

3. Control of numbers, or how many animals are to be placed in the area to be grazed.

4. Control of the animal. The farmer must be able to place the animal where and when he wants, for as long as he wants. If island livestock farmers considered all the factors that influence range ecology such as rainfall, grazing pattern, soil type, land topography, climate and the physical environment, then they should be able to have a productive pasture where forage will always be available for animal production. Thus, the key to understanding range ecology is the manipulation of vegetation and soil by controlling grazing animal patterns.

Four-Pasture Merrill System

FIRST YEAR

April - July		August - Nov.		Dec. - March	
A Rest	B Graze	A Graze ←	B Rest	A Graze	B Graze ↑
D Graze	C Graze	D Graze	C Graze	D Graze	C Rest

SECOND YEAR

April - July		August - Nov.		Dec. - March	
A Graze	B Graze	A Rest ↓	B Graze	A Graze	B Rest ←
D Rest →	C Graze	D Graze	C Graze	D Graze	C Graze

Marketing: A Key Sector in the Agriculture Industry in the U. S. Virgin Islands

By
William B. Peter
Agricultural Marketing Specialist
Department of Economic Development and Agriculture
Bureau of Economic Research

An overview:

Agriculture industry is an important sector of the economy of the Virgin Islands. It absorbs a large portion of the population in production agriculture, marketing of agricultural products, and other agriculture related activities such as disease and pest control, forestry and soil conservation. The 1987 Census of Agriculture by the V.I. Department of Economic Development and Agriculture indicated that the total number of farm workers was 660, with 454 people employed on St. Croix and 206 on St. Thomas and St. John combined (V.I. Bureau of Economic Research, 1991).

Small-scale farming characterizes the U.S. Virgin Islands' agricultural industry. Most farmers have one or two acres of land under cultivation each agricultural season. The primary inputs to production agriculture are land, labor, feeds, seeds, tools such as the long-handle hoe, the rake, the machete, and sometimes farm machinery and agricultural chemicals (pesticides, herbicides, fertilizer).

The food crops usually grown by farmers include tomatoes, okra, mangoes, avocadoes, coconuts, cucumbers, peppers, pumpkins, tannia, green banana, eggplants, cabbage, papaya and limes. These crops, along with many others, are traded through the farm-gate, the roadside markets, the grocery stores, and sometimes the government-supported farmers' markets.

In general, traditional patterns of activities that quite often result in low output dominate the production of food in the Virgin Islands. Output levels actually achieved, however, depend on factors that are often beyond the control of the individual farmer and greatly influence his production and his incentives. The shortage of rainfall, the soil high pH content, high temperatures and strong winds are some examples. These observations are within the same ballpark as those reported by Troy and Robert in 1974, and by Padda in 1992.

Current characteristics of the agricultural industry clearly show that several factors contribute to the low economic status of the small farm operators in the Virgin Islands. Therefore, there is no single solution to limited resource farm problems in the territory. In helping farmers overcome their difficulties, however, efforts are usually centered around the rate at which they are performing in their production practices. Although progress has been made in certain production categories such as the hydroponic vegetable production in a circulating fish culture, farmers still cannot market their outputs efficiently, because of lack of good supportive infrastructures and technical knowledge in making elementary marketing decisions.

Before specialty crops can be used to increase the net income of limited resource farmers, effective ways of reaching the consumer have to be worked out: roadside markets or farmers' markets have to be organized (Copp, 1984). Answers to questions relative to the kinds of marketing information available to small farm operators in different locations, and the benefits and limitations of alternative marketing systems such as direct marketing and farmers' markets, must also be found (Surendra, 1984). Until production technologies and marketing techniques are transferred to and used by farmers and agribusinesses in the Virgin Islands, no real advance can occur (Padda, 1987). Based upon these premises, if more effective strategies for agricultural development are to be designed, it will also be essential to examine in depth the marketing sector.

Characteristics Of The Current Marketing System For Locally Grown Fruits And Vegetables

Though local commercial agriculture has evolved over many centuries, the system of marketing locally grown fresh products is still traditional. Most independent vendors and farmers usually sell fruits and vegetables along the centerline roads, or around populated areas such as the shopping centers. In these market outlets, products are very often exposed to the sun which accelerates their decay thus reducing shelf life. Grades and standards are self-imposed, not legislated by law as they are in the U.S. mainland. Prices of commodities are frequently determined by bargaining, which can be time consuming. The overwhelming majority of farmers grow highly perishable commodities such as tomatoes, pumpkins, bell peppers, okra, papayas, avocadoes, mangoes, cucumbers and leafy greens. Poor handling and lack of adequate storage facilities for these crops, mainly during the glut period, bring about tremendous wasted produce in the territory, and the

results are spoilage or deterioration. All these market conditions are supply-restrictive; therefore, they do not guarantee efficiency.

Although many conditions which characterize a good marketing performance are lacking, some basic necessary conditions to exist. For instance, there are many buyers and sellers, an easy entry to the marketing profession, and a regular flow of products from the farm to the consumers in the market place.

Despite the difficulties confronting them in their production processes, Virgin Islands farmers love their profession. They have demonstrated, especially during the annual Agriculture and Food Fairs, that they can grow more and good quality products. Most of them have expressed their willingness to expand their farming operations, but only under improved marketing conditions. In fact, unless producers have confidence that prices will bear some minimum relationship to costs, they will always hesitate to take further steps to increase production or improve quality. There is no point in encouraging small farmers to undertake new crops, unless there is a marketing component in the package (Toensmeyer and German, 1982). This implies that if full advantage is to be taken of favorable production opportunities in the territory, improved facilities and organization for marketing are required. A Development Strategy For The Marketing Sector.

Agriculture in general, and marketing agricultural products in particular, cannot progress without good supportive infrastructures. In order to make the system of marketing domestic cash crops efficient and more attractive to the people of the Virgin Islands, the following initiatives are highly recommended:

a) Construction of a central open market on the islands of St. Croix and St. Thomas, respectively, for all roadside vendorin including farmers. Such an action will not only help prevent car accidents due to reckless driving, ease data collection for future marketing studies, but also allow the Department of Economic Development and Agriculture to take regulatory measures to ensure and monitor quality standards, in order to protect consumers and enhance the net income of farmers from their farming operations. More importantly, dissemination of agricultural information by the U.V.I. Cooperative Extension Service will be more effective than it has been in the past, because other market intermediary groups, besides the local farmers, would also like to be involved in the educational programs for agricultural development.

Undertaking a similar step on the island of St. John will not be feasible at this moment, because a limited number of farmers are currently growing very small quantities of marketable products.

b) Construction of a bulletin board at each government-supported marketing building to announce the monthly average prices of the major agricultural products and other important market information. Such an action will help farmers price their commodities more efficiently and increase their bargaining power with consumers.

c) construction of low-cost storage facilities to prevent products from deterioration. When these are in place, more fruits and vegetables will be available year round, and prices will be stabilized at a level benefiting both farmers and consumers.

Meanwhile, sun drying, which is an easy traditional method of preserving crops, can be used for products such as mangoes, sweet potatoes, cassava, hot peppers, okra and herbs to prevent spoilage. Information on this preservation technique of food crops is available in most East Caribbean countries.

Of course, these initiatives require education and training of individuals. The role of education in attracting youth to agricultural careers is of great importance. Providing introductory courses in the major agricultural fields of studies at the high school level, as well as the expansion of the agriculture curriculum at the university level, are of primary importance. These actions should, in the long-run, provide skilled manpower resources for agriculture's labor needs (V.I. Bureau of Economic Research, 1991). In the meantime, hands-on training in post-harvest food handling, processing and marketing for farmers and other market participants who render necessary services for commercial agriculture is crucial.

A common criticism of local agriculture is that production is not diversified enough to support the market. This criticism does not seem to be consistent with the reality, in that marketing of agricultural products is very diversified in the territory. A large number of food crops are produced domestically, and a variety of products that best meet local demand and changing tastes are also brought in from the U.S. mainland and from nearby islands. The major constraint to marketing locally grown agricultural products is the lack of organization and capital, coupled with conservatism on the part of the majority of farmers in starting medium-scale farming systems to bring their outputs up.

The need to increase the level of food crop production in the U.S. Virgin Islands is obvious, given its fast growing population, the great demand for locally grown products, and the high cost of imported commodities. In changing the physical production pattern, however, an effective organization will be necessary to bridge the gap between the farmers and the consumers, because cash returns to a producer depend to a large extent on his or her crops reaching a consumer in the market place. Expandable small farm operators must also be willing to organize into cooperatives, considering their limited resources. A farmer cooperative is a business organization, owned and controlled by its members who have come together voluntarily to provide themselves with needed supplies and services in order to improve their economic well-being. By working as a unite, Virgin Islands' farmers will accomplish something they could have never done individually. Not only will they be able to purchase better production supplies and grow more foods, they will also improve their bargaining abilities. Although building farmer cooperatives is not easy, it can be done. It takes only

leadership, dedication, training, mutual trust and the realization by farmers that their investment is essential for the success of the organization.

In light of the attention being given to the small farm problem, and the lack of efficient market for domestic cash crops, marketing of agricultural products must be considered co-equal in importance to production agriculture in the U.S. Virgin Islands. Its importance should be reflected in increased allocation of resources for its study, development, incentive programs and promotion. But allocating more resources for the development of agriculture industry in general, and marketing in particular, will be meaningless without total involvement or support from the agricultural agencies and institutions in the territory. The V.I. Division of Agriculture, the U.V.I. Cooperative Extension Service and Agricultural Experiment Station, especially, have a great challenge to work cooperatively if they are going to master the interaction between production and marketing which controls the future of local farmers. Through cooperation, they will be able to readjust their conceptualization of problems and programs in terms of new parameters, and better the economic welfare of the producers.

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Raising Turkeys in the Virgin Islands

By
Kofi Boateng
Extension Livestock Specialist
UVI Cooperative Extension Service

Anyone who has had the pleasure of eating a homegrown turkey will agree with me that they taste better than the ones we buy from the supermarket during Thanksgiving and Christmas.

Homegrown turkeys are juicier and firmer and do not contain any additives. The only disadvantage of raising your own turkeys for the holidays is that you have to spend some time feeding and taking care of them and processing them.

Young turkeys are called poults, and they mature into hens and toms. There are one breed and seven varieties of turkeys. The varieties normally recommended for home production are the large Broad Breasted Bronze and the Broad Breasted Large White.

There is a great difference in body size in turkeys. During much of their growth period the females normally weigh approximately three-quarters what the males do. Females mature at slightly under one-half of the males' weight at 36 weeks of age. However, it may not be necessary to keep the turkeys to maturity. If fed well, the hens could finish out, and weigh about 19 pounds live, at 20 weeks of age. The toms finish slower and would take 24 weeks to weigh 28 pounds.

If you plan to have your turkeys ready to kill for the holidays, April is the ideal time to start ordering your poults. Baby turkeys can utilize the same equipment (feeders, waterers and brooders) as chickens, although some basic differences do exist. Poults are almost blind for the first few days and, therefore, require objects like bright marbles in the feed and water dishes to attract them. Another difference is they are very friendly and have extreme curiosity. Tap the feeder or waterer to get their attention, and they will come immediately. This curiosity also leads them to pick at strings or holes on feed sacks or brooder curtains, with the result that some may hang themselves. They love to jump into things; therefore, do not leave a bucket half full of water or some will drown. Turkeys also frighten easily. Sudden noises or flashing lights will cause them to fly or pile against the side of the pen, damaging themselves. Other times, they just move out in the rain until drenched and exhausted by hypothermia.

Housing

A small outside building with a floor will do fine. Even a partition across the back of your garage will do. You can construct this simple house with old lumber around the yard or remodel an existing structure. The basic consideration should be to provide a clean, dry, well-ventilated area free from drafts. The house should protect the birds from weather and be screened to exclude wild birds and predators, especially dogs, rats, and mongooses. Please remember turkeys should not be raised in the same pen with other poultry because they can become infected by chickens with diseases like black head or sinusitis. For purposes of illustration, an 8 foot x 8 foot utility house will house ten turkeys adequately.

Brooding Methods

Although the temperature on our islands is adequate for raising turkeys outdoors, poults require additional heat for the first two weeks when they arrive.

Poults may be brooded under a dependable heat source as long as they are safe from fire. An infra-red lamp or a small lightbulb (60-75 watts) is satisfactory.

First, clean the area and equipment before the poults arrive. Wash with a good disinfectant like bleach. Screen the windows and doors against predators. Ventilate freely. Shield direct sun from the poults because they could overheat.

Prepare a circular brooding area bordered by cardboard approximately 16 inches high. Cover the area with 1/8 inch of dry sand. This will reduce early litter eating and provide secure footing.

Starting The Poults

Adjust the hanging heat lamp 18 inches from the floor in the center of the ring. Comfortable poults will bed down evenly spaced throughout the area. Raise or lower the lamp for temperature control. The temperature should be 90-

92°F taken two inches above the floor. Drop the temperature 5-7°F each week. Discontinue the heat after the third week. Allow 1.5 to 2 square foot of floor space per poult for the first 6 weeks of age, 2-3 square foot from 6-10 weeks and 6 sq. ft. for maturity. Do not overcrowd or allow wet spots to exist in the pen. Start the poults with one or more quart jar water founts. Switch to a larger 3-5 gallon waterer during the third week. Litter can also be added during the second week. Coarse dry shaving or chopped straw are excellent. Keep water founts clean by placing on a brick.

Feeding

Because of their early rapid growth, for the first six weeks, turkeys require a turkey or game bird starter feed, which has 28-32 percent protein. Chick starter feed is not adequate for new poults. Place the food as needed, in a flat egg tray or any small one-inch deep box top. At two weeks switch to a hanging tube feeder. One tube feeder will take care of 20 birds. Raise feeders to level of birds' back and adjust feed level to avoid waste. Allow enough room so all may eat at once.

After the first six weeks you can feed turkey growing mash or even chick starter feed containing 22 percent protein. At 12 weeks of age, you can add cracked corn to the growing mash to reduce the protein level and increase the energy.

Health

For the small turkey flock owner, health depends to a great extent upon sanitation and avoidance of other birds. Wash the waterer and supply clean water daily. Avoid use of moldy feed or litter.

Turkeys love mowed green pasture and do well on a range when given protected (roofed) roosting areas, providing predators are kept out. Fresh grass clippings and garden greens such as lettuce and cabbage may be given daily. Do not let excess greens remain to become moldy.

Because of nutrition and disease interrelationships, poults often develop leg deformities for which there is seldom a cure. However, as they mature, they do outgrow these problems and become quite hardy.

For more information on raising your own turkeys or other exotic birds, please feel free to contact me at UVI Extension Service (778-0246).

Agriculture and the Environment Make Sense and Renewable Energy is a Common Factor

By
Bevon R. Smith Jr.
Program Manager
Virgin Islands Energy Office

The Virgin Islands Energy Office (VIEO) has long recognized the interrelationship between Energy, Agriculture, and the Environment. In 1988, VIEO was successful in establishing the Territory's Agriculture Energy Assistance program measure. The main features of this program measure are to conduct workshops that educate farmers on applicable energy-efficient farming techniques and technologies, to fund small demonstration projects utilizing the same technologies and to establish an integrated-energy farm system at the Department of Economic Development and Agriculture (EDA).

The VIEO in cooperation with the University of the Virgin Islands Cooperative Extension Service/ Agricultural Experiment Station (CES/AES) and the Department of EDA have identified some energy efficient techniques and/or renewable energy technologies that have a great potential for improving the Agricultural sector. These will in turn improve the quality of air and life for the people of the V.I. Some of the technologies are as follows: drip irrigation with photovoltaic (pv)/wind water pumping systems, solar crop drying, biofuels (methane gas, methanol, gasohol, and ethanol), energy efficient greenhouses, alternative electricity generators, solar Distillation, and hydroponics.

The first water and energy conservation technology taught to the farmers was using drip irrigation with pv/ wind water pumping. Local irrigation specialist and pv/ wind manufacturers were on hand to discuss the various types of irrigation systems, of which the drip system was highly recommended in most cases. In addition, farmers had the opportunity to witness the advantages of three types of solar-powered systems: wind generators, wind water pumpers and photovoltaic array.

According to the engineers at the Photovoltaic System Design Assistance Center, at the Sandia National Laboratories, the pv-powered systems that are installed all over the world demonstrate higher reliability and lower costs than the alternative methods in a large class of applications. PV-powered pumps are particularly useful for intermediate applications like remote villages and perfect for livestock watering and/or crop irrigation. The idea is that when the sun is hottest, crop and livestock water demands increase, and the pv powered pump operates at a greater efficiency.

Many people wonder why the pv-power technology is not more widely used since it requires only adequate sunshine and a source of water. The VIEO believe that pv (as well as other renewable energy technology) is limited only because pv power is a fairly new technology and many potential users are simply unfamiliar with it. It was on this premise that we structured the Farmers' Energy Conservation Demonstration (FECD) project, where farmers can obtain Department of Energy (DOE) funds to demonstrate to the rest of the community how sensible and cost effective it is to incorporate renewable energy into agriculture and maintain a clean environment.

Presently, V.I. residents can become familiar with four different types of pv- powered water pumping systems that are being demonstrated at nine farm sites throughout the three islands. There is a direct solar system (no batteries), three mobile surface DC pumps with a battery storage only, two submersible AC pumps with inverter and batteries, and three systems that feature submersible AC pumps with an inverter, a battery bank and storage tanks. These water pumping systems are modular and are matched closely to each farmers' need. They require low maintenance and recurrent costs, and have a relatively reliable, long life. The obvious disadvantages are the high capital costs and lower output in cloudy weather. However, remember that water needs on local farms are lower during periods of cloudy weather. For more information about the technical features of the systems, arrange for a site visit, by registering at the VIEO Ag Fair display booth.

Another aspect of Solar Energy that farmers and the public need to re-familiarize themselves with is wind

energy.

Yes, the sun causes the cool tradewinds that are so frequent in our islands. Wind is the result of the constant movement of high air temperature over lower air temperatures. Harnessing wind power is not a new idea, but design and technology of wind machines have changed from the old-style water pumping windmills. Unfortunately, none of our local farmers were convinced enough to try demonstrating any of the various types of electricity generating wind turbines, but three veterans opted to demonstrate the old mechanical water pumping windmills. These three wind systems are also available for the general public awareness. The use of these pv/wind systems will save V.I. farmers an estimated $200,000 per year and give them reliable power for irrigation.

The FECD project has offered an alternative to the energy intensive means of drying crops and/or meats. Drying is effectively removing moisture from a material to a level that it can be stored for extensive periods without deterioration. Farmers were introduced to the basic drying principles, the preparation of products and the various types and application of solar dryers.

The present stage includes building inexpensive solar crop dryers for farmers who participated in the educational workshop. This workshop series demonstrates how incorporating renewable energy techniques can make agricultural and environmental sense.

In the near future, VIEO in cooperation with UVI-CES/AES and Dept. of EDA will continue to offer workshops and small demonstration projects in the area of Biofuels. It is anticipated that experts will share the latest technological update in the areas of biomass to methanol and ethanol. Methanol, or ''wood alcohol," is a colorless, odorless, toxic liquid. It is an alternative fuel that can be produced from domestic resources, both fossil fuel and renewable. It is commonly used as a feedstock for producing methyl tertiary butyl ether (MTBE), an octane-enhancing gasoline additive. It can also be used as a gasoline substitute or in a blend with gasoline, most commonly as M85 (85% methanol, 15% gasoline). On the other hand, there is ethanol which is similar to methanol but is a potentially clean-burning fuel that reduces air pollution problems such as smog and carbon monoxide. Ethanol feedstock can be developed from cellulosic biomass - herbaceous and woody plants, agricultural and forests residues and municipal solid waste.

The areas for demonstration projects were enhanced with the passage of the 1990 Clean Air Act Amendments which were the first major overhaul of the nation's clean air legislation. This will have significant impact on agricultural mandates as they relate to ''clean fuels'' and ''oxygenated fuels.'' Using alternative fuels can be an economic boost for the agricultural sector and, at the same time, can have a positive impact on the air we breathe.

These amendments took a giant step forward with the passage of the National Energy Policy Act of 1992. In addition to containing provisions that encourage competition in the way electricity is generated and sold, this new law consists of provisions to encourage the development and use of clean burning alternative fuels and research development on a host of exciting new energy technologies--including advanced clean coal, natural gas, renewables and conservation.

New age farmers are seriously considering expanding their income by becoming more self-sufficient. The exposure to the advantages and disadvantages of methane, propane and liquefied petroleum gas will better equip them with pertinent decision-making information. The FECD project is also prepared to enlighten farmers on solar cooling techniques for tropical greenhouses, and solar electricity generators for recycling tilapia fish culture wastes to fertilizer for hydroponics farming.

The above mentioned technologies can be demonstrated only by a few farmers at a time. However, the VIEO Agriculture Energy Assistance program is working on setting up an integrated-energy-farm-system (IEFS) at the Dept. of EDA where all the renewable energy technologies can be integrated. This will be an ultimate goal, enabling the support agency for agriculture development services to demonstrate to the farming community self-sufficiency, while simultaneously providing energy-efficient and clean agricultural services. Doesn't this make great sense/cents?

Sweet Potato: A New Look at an Old Crop

By
Stafford M. A. Crossman
Research Specialist
UVI-Agricultural Experiment Station

A crop that originated in central or north-western South America, sweet potato has been cultivated since about 3000 B.C. It was one the first crops introduced into Europe after Columbus landed in the Caribbean. However, despite its ability to adapt to a wide range of tropical conditions while producing adequate yields, it still remains an under-rated crop.

Sweet potato is an important food crop in tropical areas because the storage roots provide high quality staple food calories. Human consumption is one of the most important uses of sweet potatoes, and they are consumed either as fresh or processed products. They can be prepared fresh by either boiling, frying, baking or roasting.

Sweet potatoes are a good source of carbohydrates, which generally make up 25-30% of the fresh weight and 80-90% of the dry weight of most cultivars. Ninety-eight percent of this carbohydrate is easily digestible. Firmness, dryness and mouthfeel are largely determined by the composition and properties of the carbohydrates.

Sweet potato contains between 16-40% dry matter, 20% starch, and 5% simple sugars. They are a good source of calcium, iron and other minerals. They are also an excellent source of vitamins, particularly vitamin A in the orange-fleshed cultivars, and vitamins B and C.

The most abundant vitamins from a human standpoint are beta-carotene (pro-vitamin A) and ascorbic acid (vitamin C, 20-50 milligrams per 100 grams of fresh weight). Beta-carotene is the major pigment of the orange-fleshed cultivars. It is a good source of Vitamin B (thiamin), which is present in adequate quantities, if the crop is consumed as a staple.

The protein of sweet potato has a good biological value, but its contribution to overall nutrition has been overlooked until recently. Protein content in sweet potato roots ranges from 1.7-23 percent on a dry weight basis (4.4 - 5.2 percent for most varieties) and is quite evenly distributed throughout the root. Tryptophan and sulfur amino acids are limited in sweet potato, while others such as methionine and lysine are in excess. Sweet potato protein can be used to supplement other plant proteins. Flesh color is important to protein content: the more intense the color, the higher the protein content. Protein content is directly proportional to yield, as protein content does not decrease as yield increases. Large varietal differences exist in sweet potatoes for protein content which also varies with applied nitrogen levels.

There has recently been a strong upsurge of interest in the dietary fiber components of plant foods. This is due to studies

that have implied that increased dietary fiber may reduce the incidence of a variety of diseases such as colonic cancer, diabetes, certain kinds of heart disease and a variety of digestive disorders. Sweet potatoes are potentially a significant source of dietary fiber. Inclusion of sweet potato in the diet of V.I. residents can help to meet their dietary fiber requirements with all the other health benefits associated with increased fiber in the diet.

The nutritional qualities of sweet potato should be of great interest to vegetarians or others who do not consume much meat. Sweet potato can become an important component of such diets. Not only are sweet potato roots rich in nutrients, but the leaves of tender shoots are richer than the roots, in protein, vitamins and minerals. Sweet potato leaves can serve as an important source of vegetable fiber and food. Sweet potato shoots are nutritionally superior to many other leafy vegetables including cabbage, lettuce, watercress and amaranths. They are also superior to spinach, except for vitamins A and C. Sweet potato tops have been found to contain total nutrients equivalent to beef or pork. Protein in sweet potato leaves is 12.1 - 25 percent depending upon variety. Most varieties have 19.5 - 20.5 percent protein. Leaves and young shoots are edible and may be prepared in a manner similar to greens, eaten boiled, or used in soups and stews. In some countries sweet potatoes are grown primarily for the shoots rather than storage roots.

Sweet potato is a very versatile and valuable crop, with its edible roots and shoots. These factors have resulted in the selection of sweet potato as a potential crop for use in manned space missions and the space station. The crop will be grown and consumed in space.

Sweet potato can be used in a diversity of simply prepared food dishes. It is easy to handle, stores well, can be used in many ways and is highly nutritious. It can also be processed into flour, starch, noodles, chips, candy, yogurt, ice cream, jellies and syrup.

Non-sweet cultivars have the potential for multi-purpose uses similar to those of the white potato. There are many food recipes in which these cultivars can be substituted for white potato, which is important because we can increase the consumption of locally produced sweet potato while reducing our dependence on imported white potatoes. Nutritionally sweet potato is equal to or exceeds white potato in the amounts of minerals, protein, fiber, carbohydrates, calcium, phosphorus, vitamins and energy per unit weight.

Sweet potato can have a great future as a dietary staple in the Virgin Islands. Locally adapted cultivars can easily be propagated from abundant foliage and produced throughout the year. Sweet potatoes can tolerate infertile soils and other tropical stresses while producing good yields. Crop residues of sweet potato are a very useful animal feed, as all parts of the sweet potato plant can be utilized for this purpose.

In the Virgin Islands, as in most other tropical areas, sweet potatoes are not given priority for intensive management practices. The crop is usually planted in the dry season, when it is not feasible to grow vegetable crops. It is usually grown without applied fertilized and is only weeded when infestations are severe. UVI-AES research has demonstrated that sweet potatoes do respond to increased levels of inputs and technology.

Factors affecting sweet potato production over which we have the potential to exert substantial control are soil nutrition, moisture level and germplasm selection.

Ideally, sweet potatoes require loose friable soil in which to grow. The crop is more tolerant than most other tropical crops to a wide variety of edaphic and climatic conditions. However, the soil in the Virgin Islands can cause some stress conditions for plant growth - high soil pH, phosphorous and micronutrient deficiencies, heavy soils and low annual rainfall (a deficit in 10 of 12 months annually). These factors most certainly can reduce yield; therefore steps need to be taken in order to modify or rectify these conditions. Yields can be substantially increased if plant nutrition, water requirement and germplasm selection are given adequate attention. The soil should be friable enough to permit unimpeded root enlargement and have sufficient aeration porosity to provide oxygen to developing roots. Mounds or ridges results in better yields - partly attributed to better drainage, aeration and physical resistance of the soil for lateral expansion of storage roots. Storage roots displace their volume equivalent of soil by deforming the adjacent soil. Inadequate land preparation of heavy soils can cause an elevated physical resistance of the surrounding soil which will result in reduced yields with distorted storage roots.

Selection of appropriate germplasm is vital because locally adapted high-yielding cultivars can reduce the need for additional inputs. Cultivar traits can reduce production practices and, thus, production costs. Cultivars can compensate for climate or modify cultural treatments. Drought resistance modifies irrigation needs; insect resistance changes pest control procedures; and high vigor is a factor in weed control.

The nature of the growth of sweet potato makes it an ideal crop for food security in areas predisposed to tropical storms. If a storm occurs after the plants have started producing storage roots, even if the above-ground parts of the plants are destroyed the storage roots will be safe below the ground, to provide food and planting materials.

Sweet potato is considered to be a drought-tolerant crop because it is quite deep-rooted, and fairly good yields have been obtained under low-moisture conditions. Despite this, irrigation experiments clearly demonstrate that yields can be significantly increased by irrigation in areas like the Virgin Islands, where rainfall distribution is erratic or insufficient.

If sufficient moisture is supplied for the plant to become well established, it will be better able to use reserve moisture under dry conditions later in the season. Water-logged soil during the growing season and shortly before harvest may result in loss of storage roots due to rotting in the soil.

A sweet potato crop provides good protection against soil erosion, except immediately after harvesting on sloping areas which leaves the land in an eroded condition.

Recommended cultivars occupy the land for only 3 - 4 months. This allows farmers to plant and harvest more than one crop of sweet potatoes per year. The farmer also has ample time to produce one or two more short growing crops during

the year if so desired. Intercropping with compatible crops can also offer advantages. This is of particular importance for small farmers.

The level of culture for sweet potato is relatively simple and the crop can be easily produced on areas of land varying in size from a backyard plot to large acreages.

The stem, which is the propagating material, is useful as feed but not as food and thus the principal edible portion is not sacrificed when a new crop is planted.

For maximum growth sweet potato should be terminal vine cuttings 30 cm long, from well-nourished actively growing two-three month old plants. Cuttings should be stored under damp, well-aerated conditions for one-two days. They should be planted in the field without excessive exposure to the sun or drying out and buried up to two-thirds their length in soil. Water and adequate aeration are also particularly important during the establishment of the cutting.

Someone once referred to sweet potato as "a tiresome crop for everyday." This is definitely not a true reference, because there are so many sweet potato cultivars available for producers and consumers to choose from. Sweet potatoes are available to meet all personal preferences, and consumers can choose based upon skin color, flesh color, degree of sweetness, firmness, dryness, mouthfeel and other nutritional characteristics.

Sweet potato cultivar types can be grouped into category types:

- **Dessert type** - orange-fleshed, moist mouthfeel, and very sweet (mainly U.S. cultivars, where they are referred to as 'yams.')
- **Tropical type** - white- to yellow-fleshed, low to high sweetness, with intermediate to dry mouthfeel.
- **Staple type** - white-fleshed, non-sweet (low sugar), high starch, bland taste, suitable for everyday use.
- **Industrial type** - high-yielding with very coarse texture and other characteristics which makes them suitable for animal feed or other industrial uses, including starch and alcohol production.

With such a large variety of nutritious sweet potatoes available for so many uses, isn't it time that we all take a new look at producing and using this old crop ?

Composting: An Appropriate Method of Soil Conservation for the U.S. Virgin Islands

By
Manuel C. Palada, Ph.D.
Research Assistant Professor
UVI-Agricultural Experiment Station

What is Compost?

In broadest terms, composting is the biological reduction of organic wastes to humus. Any organic waste in the form of dead plant or animal tissues and waste products from metabolism is subject to decomposition by soil microorganisms and other soil fauna. The final product of this breakdown process is a stable compost material, also known as humus.

The use of compost has been recorded in the history of civilization as early as the Akkadian Empire, which flourished in the Mesopotamian Valley a thousand years before Moses was born. Compost was also known to the Romans, the Greeks had a word for it, and so did the tribes of Israel.

In the traditional method pioneered by Sir Albert Howard, the raw materials are gathered into a pile and so managed as to generate enough heat to reach an initial temperature somewhat between 60 and 70°C. At this temperature rapid breakdown of organic residues occurs, and weed seeds and parasites are destroyed. The pile is turned one or more times to introduce additional oxygen and to bring undecomposed litter from the outside to the center.

Figure 1 is an illustration of the composting process and demonstrates the importance of oxygen and moisture. The various nutritive elements, such as proteins, amino acids, lipids and carbohydrates, are assimilated easily and broken down by the microorganisms. They mainly serve to produce energy (which raises the temperature) and after undergoing various degradation processes are finally reduced to carbon dioxide and water, whereas cellulose, lignin and ashes (the mineral fraction) contribute to the humus production. Obviously, the microorganisms play an important part of these processes. They appear during decay of the organic matter, take part in its conversion and contribute in the build-up of humus through their own subsequent decomposition.

Today, composting is practiced by many home gardeners and vegetable growers as well as large-scale farmers. The main objectives of composting are to recycle the organic waste, bring it to a form that can be used for enriching the organic matter content of the soil and improve its fertility.

Compost Improves Soil Structure

Compost can correct a soil that is either too sandy or too clayey, thus helping to build good structure and a good environment for plant growth. Soils which have been chemically treated with little or no addition of organic matter will gradually lose structure, requiring increased fertilization, cultivation, and irrigation.

A heavy clay soil with low organic matter content tends to become waterlogged quickly, preventing water and air penetration. Adding compost helps to loosen this packed soil by opening up pore spaces that carry air and water down into the soil. Sandy soils which tend to let water drain away too rapidly are also rebuilt by the addition of compost. The fine particles are united into larger ones that can hold greater quantities of water.

Compost Controls Soil Erosion

A soil lacking good crumb structure is susceptible to erosion. Erosion is often the end result of a gradual loss of soil fertility. Compost helps to build the good crumb structure that encourages optimum fertility and resists erosion. Incorporation of organic materials into the soil in the form of compost is a sound land management practice that leads to good soil conservation.

Compost Improves Soil Aeration

Aeration is extremely important to soil health. Air plays a vital role in the maintenance of soil productivity. Without air, soils tend to become alkaline, organic matter decreases, active humus becomes deactivated, total and active humus content decreases, nitrogen content is reduced, and the carbon:nitrogen (C:N) ratio is lowered. The presence of sufficient air in the soil is necessary for the transformation of minerals to forms usable by plants.

Many of the processes in the soil are oxidative, such as when sulfur is transformed to sulfur dioxide, carbon to carbon dioxide, and ammonia to nitrate. Oxygen is

essential in these processes and air is an urgent need of the many beneficial soil organisms that aid in these transformations. In addition, aeration helps the formation of mycorrhiza, a fungus that acts in partnership with the roots of a plant to feed with soluble nutrients. Compost helps to build soil structure that will allow the optimum aeration at all times.

Compost Provides Soil Nutrients

Compost is a good source of soil nutrients, and serves as a vehicle for carrying nutrients to soil and plants. Naturally occurring nutrients in compost are released slowly at a rate at which the plants can use them most profitably for optimum growth.

For organic farmers and home gardeners who are more concerned of their soil health and environment, compost is one of the best alternatives to chemical fertilizers. The use of compost can also reduce the dependence on chemical fertilizers.

Factors Essential for effective Composting

Several conditions are important for proper composting to takeplace. These factors are C:N ratio, moisture, aeration, and temperature.

1. **Appropriate carbon: nitrogen ratio**. The materials to be composted should have an appropriate C:N ratio from 20:1 to 30:1. With a higher ratio (more carbon) the composting process takes place more slowly. With a lower ratio there is increased chance of loss of nitrogen to the atmosphere. In practice, this means using a blend of high carbon materials such as leaves, straw or sawdust (these materials are often called ''bulking materials,'') and high nitrogen materials such as livestock manure, sewage sludge, processing wastes or fresh vegetative matter.

2. **Optimum moisture content**. Moisture content between 40 and 60% should be maintained. If the material is too dry, the lack of moisture will slow microbiological activity and the compost pile will not heat up properly. A compost pile with excessive moisture content will not stack in windrows properly and will have insufficient oxygen for the microbes. In addition, too much water in the pile may cause soluble forms of nitrogen or other nutrients to leach from the compost.

3. **Proper aeration**. The microbes which break down the organic materials in the composting process require oxygen, so proper aeration is critical. If the compost pile has insufficient air resulting in anaerobic conditions, the decomposition process is slowed and odors may occur. Aeration of compost is achieved by physically stirring or turning the pile periodically, forcing air through the pile with fans, or placing tubes into the pile. Aeration of compost pile is also dependent on the particle size of the organic residues going into the pile.

4. **Proper temperature.** Compost must be able to achieve and maintain proper heat to speed biological activity and to help kill weed seeds and plant pathogens. Although the composting process produces considerable heat, retaining it can be difficult during cool weather. Similarly, in the summer an actively decomposing compost pile may develop enough heat to encourage loss of nitrogen as ammonia gas. Thus the overall size and shape of the compost pile is important in regulating the temperature. Generally, smaller piles do not heat up faster than bigger piles. A compost thermometer or other temperature monitoring equipment is necessary to ensure that proper heating is occurring.

Materials for Composting. In the Virgin Islands there are various forms of organic materials available for composting. These materials range from household garbage to farm and garden wastes. Almost any organic material can be composted if the proper C:N ratio, moisture content, and aeration can be maintained. The most economically advantageous composting operation takes advantage of materials that are readily available at low cost.

The cities are an excellent source of compostable materials such as yard wastes and sewage sludge. Raw material processing enterprises such as food industries, lumber mills and paper mills also generate compostable nutrient-rich materials. Composting at this level will eventually reduce waste disposal problems, minimize pollution and improve the environment. In selecting materials to compost, attention should be given to their C:N ratio. High nitrogen materials are usually more difficult to obtain than high carbon materials. Livestock manure is the most commonly used high nitrogen material on farms, although sewage sludge, paunch manure and processing wastes are also commonly used. In some cases, a farm without livestock may find it worthwhile to grow vegetative crops to compost for use as a fertilizer and soil amendment on high-value perennial crops.

Common Methods of Preparing Compost

Methods of preparing compost can vary from simple, small-scale backyard composting to a more complex and sophisticated high technology involved in a large-scale commercial composting operation. An appropriate method will depend on the volume of composting materials, availability of labor and environmental conditions. In the Virgin Islands where there is shortage of farm labor, medium to large scale composting operations may require mechanization. However, for small-scale farmers and home gardeners, composting can be performed using manual labor with small, but efficient hand tools.

The common methods utilized in composting are: 1) stack method, 2) pit method, 3) windrow composting, 4)

static pile composting and 5) vessel composting. The first two methods are most appropriate for small-scale farmers and home gardeners, while the other methods are appropriate for large, farm-scale composting.

1. **Stack method** - This technique involves the preparation of compost above the ground. It is perhaps the easiest and most suitable during the rainy season in the tropics, and it saves labor during the building, turning and handling of compost. However, it may be in-convenient when making small quantities of compost, since decomposition may be poor. Where there is no inner cover, hygienic conditions become a problem. During dry weather, a large quantity of water may be required to replace what is lost by evaporation from the stack.

2. **Pit method** - This technique is most appropriate in the dry season in arid to semi-arid regions like the Virgin Islands where water availability is a problem. Its advantages are that it does not permit excessive moisture loss, and, where organic matter is of kitchen origin or animal waste, it is a more hygienic method, as these wastes are buried so that they do not become a breeding ground for house flies. However, labor costs in digging the pit and handling and turning of mature compost are rather high.

Dangers of poor decomposition from water-logging also exist. A pit with dimensions of at least 3 meters wide, 8.5 meters long and 60 cm deep is dug into the soil. Areas with a high water table should be avoided, and pit depth should not exceed 60 cm or aeration will be adversely affected. For ease of compost handling, the pit should have slanted edges. Usually, pits are dug adjacent to each other so that transferring compost during the turning operation is easy.

3. **Windrow composting** - This method is most commonly used on farms, as it best takes advantage of machinery and other resources already available to the farmer. In the windrow method, compostable materials are piled in rows from 2 to 3 meters wide and 1 to 2 meters high. Building the pile is frequently done with a front-end loader.

An alternative method utilizes a PTO (power take off) driven manure spreader. The windrow is typically stirred 2 to 6 times over several months. Stirring provides aeration, brings the cooler outer material into the hot center of the piles, and redistributes the moisture and mixes the materials. Stirring can be accomplished with a front-end loader, a manure spreader or a machine built specifically for turning compost.

4. **Static pile composting** - This method makes more efficient use of available land and seems best suited to composting large quantities of uniform materials. A static pile is not stirred once it is built, and aeration and cooling are provided by forcing air through the pile with fans. This method is frequently used to compost sewage sludge or processing water.

Composting at the Agricultural Experiment Station using the pit method.

5. **Vessel composting** - This is the most capital intensive method as it requires a concrete structure to hold the composting materials. This method may use both stirring and forced aeration. Vessel composting seems to have the greatest advantage when composted material must be dried to a low moisture content suitable for bagging, in that it allows for greater control over product quality.

Regardless of which method is used, some of the materials to be composted may require shredding or some form of particle size reduction. Hay tub grinders, hay bale choppers and wood chippers are often used on the farm. Other equipment is available commercially for the job of shredding and/or chipping materials. Good resources include Biocycle magazine, Organic Gardening magazine and home gardening catalogs.

Levels of Composting for the Virgin Islands

Composting operation in the Virgin Islands can be accomplished at three levels: 1) home garden, 2) farm and 3) industrial.

1. **Home garden** - Composting at home garden level is simple and easy to undertake since it involves small volume of organic materials. Both the stack and the pit methods are appropriate for preparing compost in home gardens. The choice will depend on the season when compost is prepared. If the composting is initiated during the rainy season, the stack method is preferable. In the dry season, when available water is limited, the pit method would be most appropriate.

Materials for composting in home gardens may include yard waste, plant residues, grass clippings, newspapers, hay, weeds, animal manure and compostable kitchen garbage. In using these materials, a correct balance of carbon and nitrogen should be maintained.

2. **On-farm composting** - The efficient utilization of organic farm wastes can save Virgin Islands farmers hundreds or thousands of dollars in fertilizer costs and at the same time reduce energy consumption as well as improving soil fertility. Today, composting at farm level is becoming popular with many farmers in the mainland U.S. It can be also adapted in the Virgin Islands. In a typical farm operation, organic wastes are produced on a continuous basis. These wastes consist of crop residues and/or livestock manure depending on the type of farm enterprise.

Depending on farm size and the amount of organic waste, various methods of composting mentioned previously can be utilized. A farmer can start a small-scale operation using simple composting equipment he already owns and later expand to a larger scale when he has capital to invest in bigger equipment.

3. **Composting of industrial wastes** - The growing population and expansion of industries in the Virgin Islands continue to intensify the problems of urban and industrial waste disposal. The best solution will be one that satisfies all sanitary requirements, does the job economically, and provides a useful end product.

In the Virgin Islands the widely used methods of garbage disposal are landfill and dumping. These methods have disadvantages. Drawbacks to the sanitary landfill include the frequent necessity for long distance hauls to suitable sites, scarcity of suitable sites in heavily populated areas, the limited future use of fill sites and lack of available cover material. Dumping has the obvious disadvantage of health and fire hazards.

Composting has clear advantage over landfill and dumping. First, it converts urban and industrial wastes into a usable end product. Secondly, compared with the sanitary landfill method, a carefully located compost plant would reduce hauling costs. Third, a well-designed compost plant can handle dewatered sewage solids, especially if mixed with ground refuse, and fourth, composting principles used for garbage and trash disposal also apply to any industrial wastes, so that municipal plant could be used for the combined disposal of these wastes.

Of course, another basic advantage to composting is the fact that use of compost by gardeners and farmers would increase tremendously,partly aiding in the conservation of soils in the Virgin Islands. Now is the time for Virgin Islanders to consider composting at all levels and realize the benefits to soil and environment.

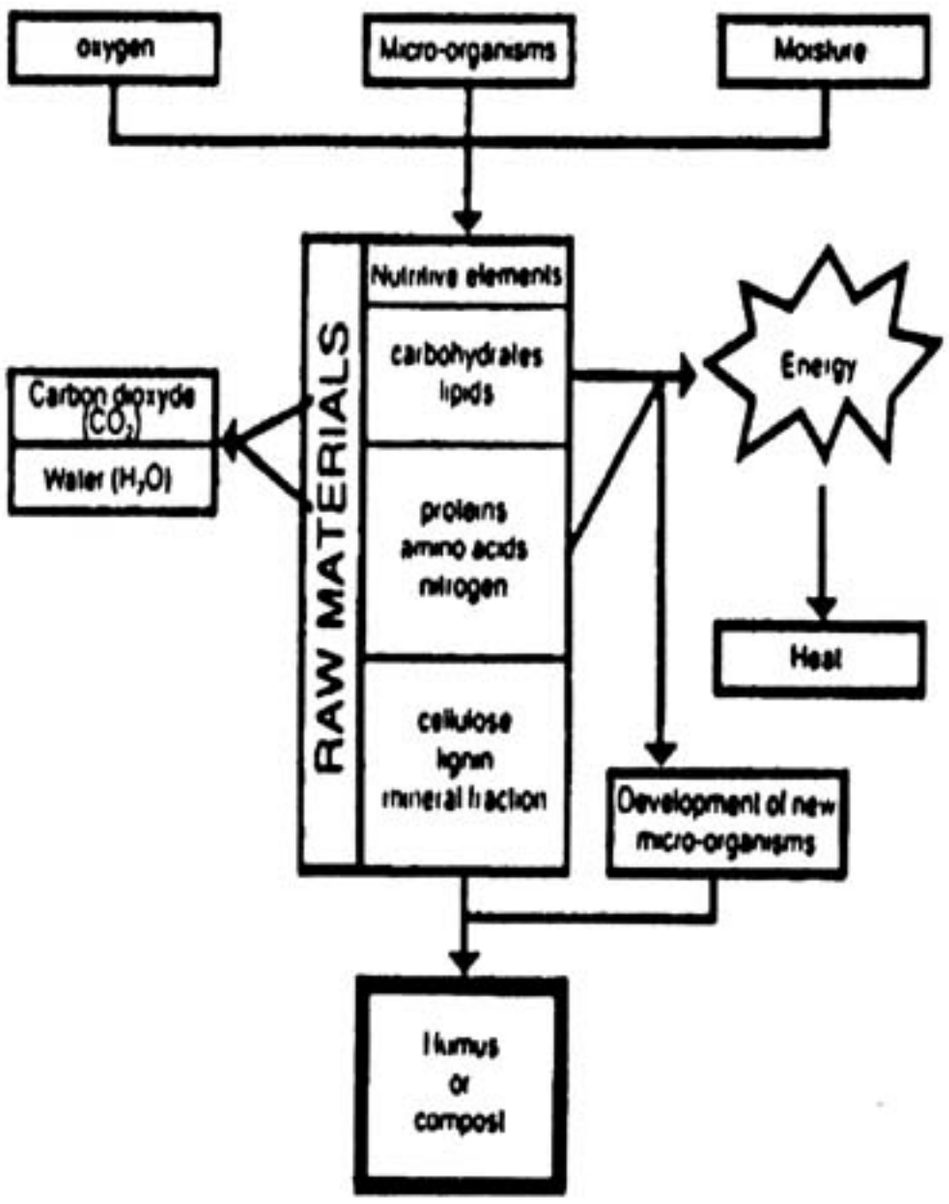

Figure 1. The composting process (adapted from Pfirter, et, al, 1981)

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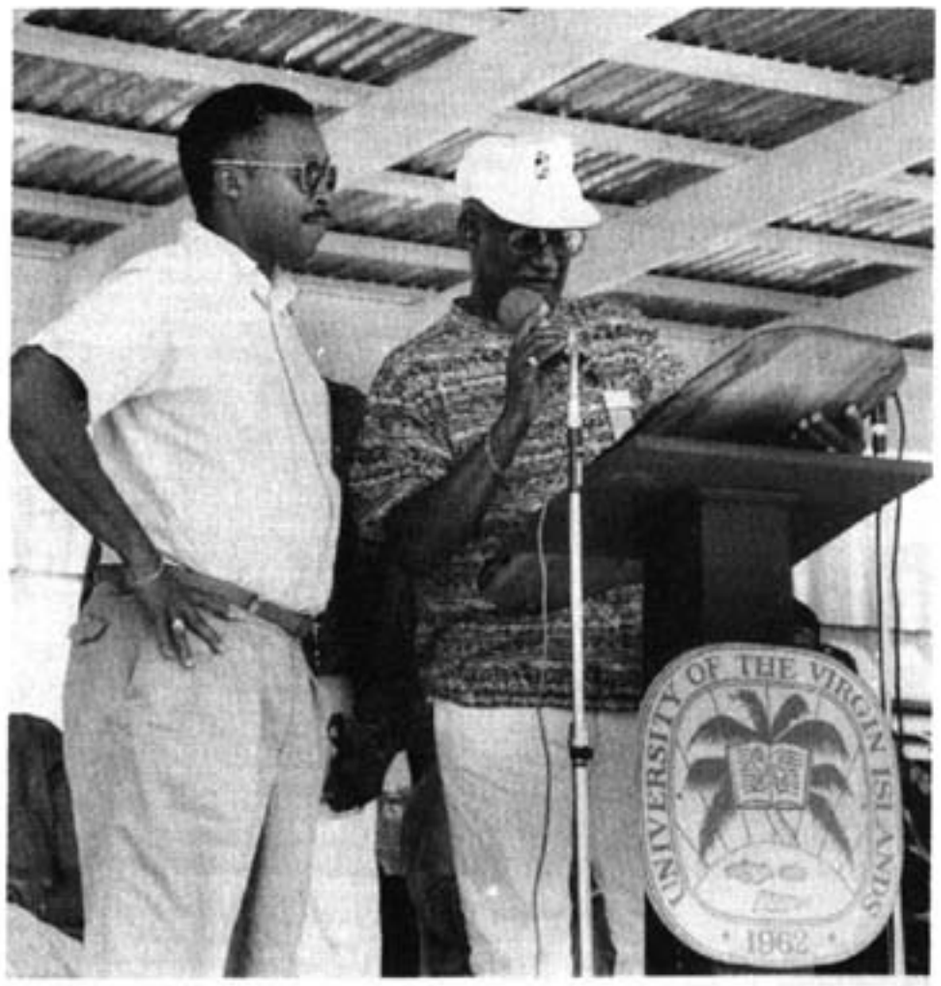
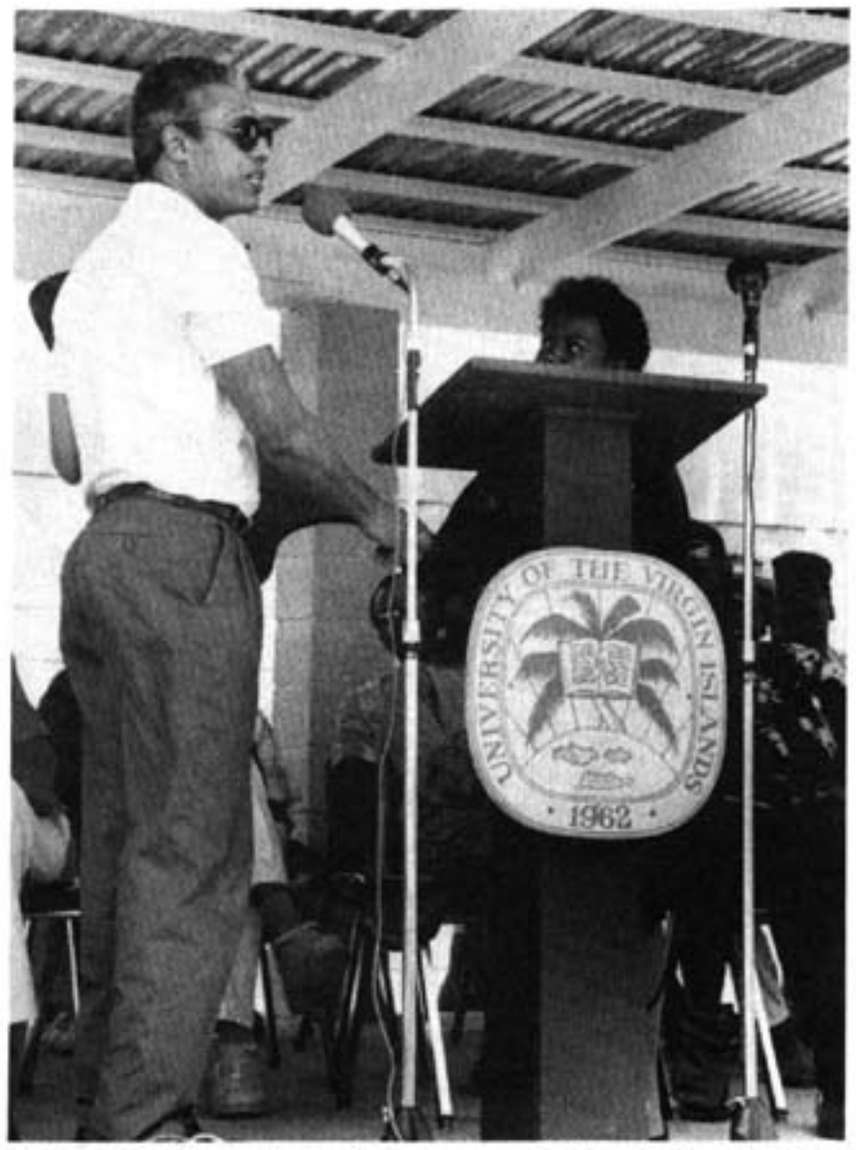
Snap-shots from

Agrifest '92...Educational, Cultural and Fun!!



Mr. Robert Moorehead ,(left) former Director of the Bureau of Corrections, accepting the Special Recognition Award for the outstanding job at the Anna's Hope Corrections farm from Mr. Sam Bough , District Supervisor office of the Delegate.

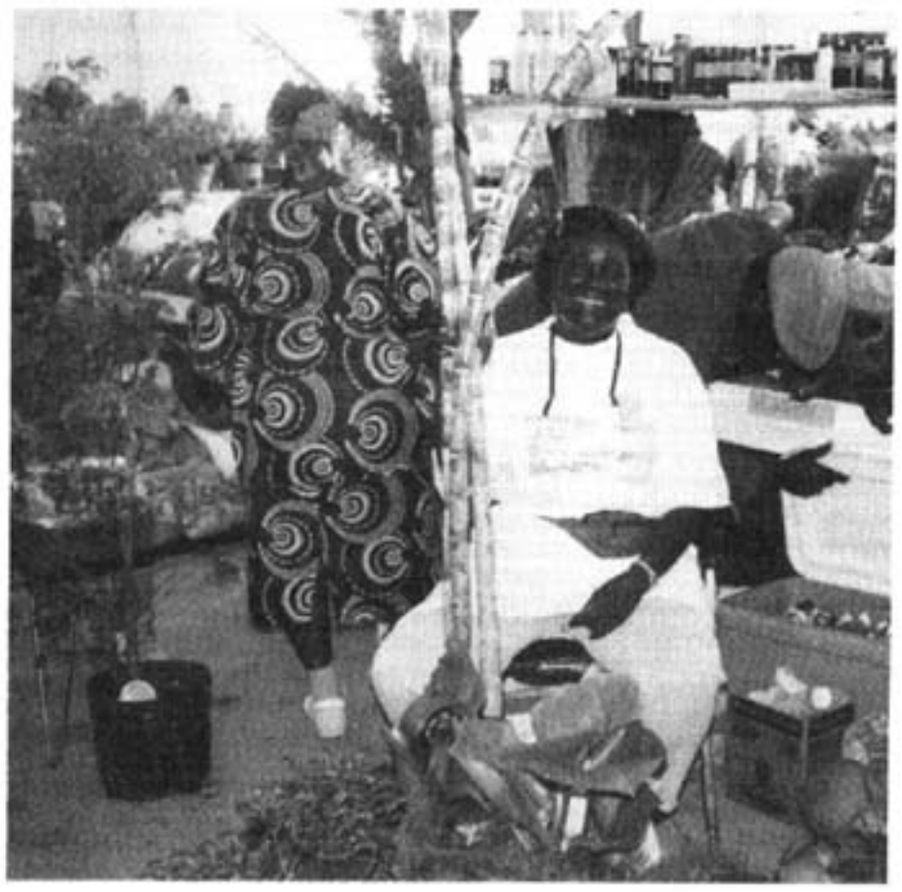


1992 4-H Youth Award given to Chiku Hodge by UVI President Dr. Orville Kean.

Mr. Gilmore Erikson,(center) owner of Ye Feed Shoppe, presented Farmer of the Year Angel Luis Gonzales (right) with various prizes.

Rev. Eddie Williams (center) accepting the 1992 Recognition Award on behalf of the V.I. Future Farmers of America from Senator Bent Lawaetz (right) and Joseph Fulgence, Director of Youth Activities (left).


DOG LOCKS HONEY




POULTRY OF THE
WORLD
NOT

A Great Year for Energy in

Agriculture

- Renewable Energy Irrigation Systems save farmers $200,000 in the first year!
  - 1 Photovac System - St. John
  - 2 Photovac Systems - St. Thomas
  - 6 Photovac Systems - St. Croix
  - 3 Wind Systems - St. Croix
- 75 Farmers (St. Croix, St. Thomas, St. John) attend solar crop drying seminar
- Division of Agriculture (EDA)
  - Demonstration Pumping System
  - Integrated Energy Farm System

Education

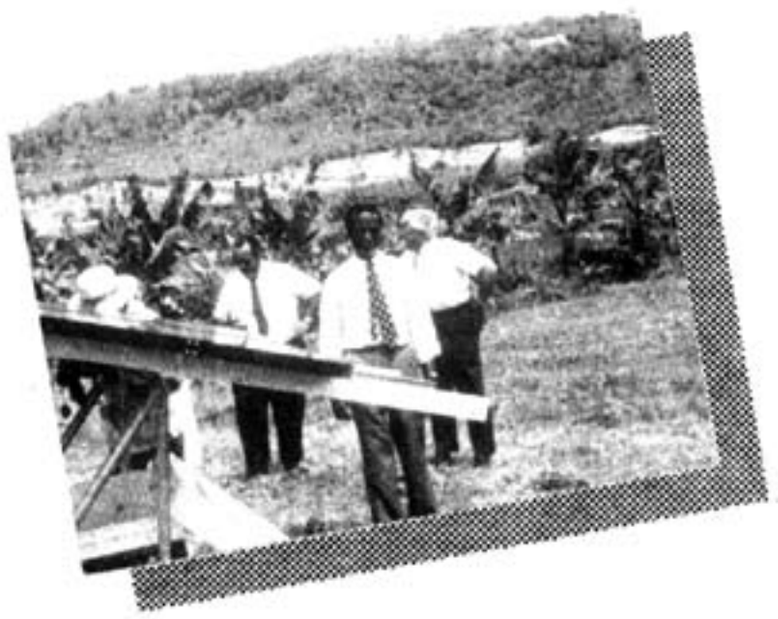
- 40 Public / Private School Teachers get science lessons from Laurence Livermore National Energy Lab
- Commissioner of Education names Energy Management Team
- Co-Sponsorship of VITEMS at UVI 40 teachers attend
- Sandia National Laboratories and others provide technical training to Energy Office Staff

Private Sector

- Green Light Program nets St. Thomas Retailers Association
- YES (Your Energy Savings) meets St. Thomas Home Show, Kaleidescope, Flamboyant Gardens and others
- Energy Policy and Energy Management Presentations for Rotary, Realtors Association, Architects and Developers.
- Rebate Program stimulates $5.5 million in sales and 14 billion BTU reduction annually. New Cycle includes Surge Suppressor systems, Efficient Lighting, Solar Water Heaters.
- Training &Certification of Architects, Engineers and Contractors as Energy Auditors and Technical Analysts.

Government

- UVI - $195,000 energy conservation upgrades
- St. Thomas Hospital - $95,000 for energy conservation upgrades
- Green Lights Program trains all agencies in Lighting Surveys and Upgrade Planning
- Energy Audits for Government Buildings
- Co-Sponsor of Comprehensive Waste Management Program
- Well Inventory (STT, STJ), and Reverse Osmosis Demonstration Project for WAPA
- Co-Sponsor (with DPW) - Recycling Workshop
- Matching Funds for VITRAN Buses
- Veterans Memorial Park showcases Solar Power for Fountain Area Lightingand Eternal Flame
- EEMIS - Electronic database and alalytical tools to report economic, environmental, and energy efficiency impact of energy projects



and...

The Best is Yet to Come

(Quote by Farrelly-Hodge 1991)

1. Solar Water Heating System for the St. Croix Hospital.

2. 50 to 70 Residential, Commercial and Industrial Energy Audits to select model sites for FREDERIKSTED RENEWABLE ENERGY DISTRICT.

3. Customized, high-tech Video/Audio Tele-conferencing System for the Department of Education.

4. A solar powered maximum efficiency Energy Office at the Frederiksted Customs House.

5. Regional Energy Conference and Manufacturers Expo

6. Resource Assessment Sites and training to measure solar and wind resources and imporove engineering/ design of Renewable Energy Systems.

7. Participation in MAHO BAY Sustainable Development Resort/Research and Study Center.

8. RENTECH brings 30,000 gallons of water to residents of Harrigan Court using Photovoltaics and reverse Osmosis.

The Wasp and the Rubber Tree

By

Rudy G. O'Reilly, Jr.
Extension Agent-Natural Resources
UVI Cooperative Extension Service

The plant genus Ficus is represented by some 900 - 2,000 species world wide and is mainly native to the Old World tropics (1). Classifications are sometimes disputed causing much disagreement as to the actual number of species. St. Croix has two native Ficus species: F. citrifolia, or short leaf fig, and F. urbaniana. Both have been used for fence posts and occasionally for ornamental purposes.

Some species are grown for rubber and fig production. The latex is high in resin and yields poor rubber. The figs, however, are edible and used for both human and animal consumption. These figs, or syconiums, are globular receptacles which enclose many flowers that later develop into one-seeded fruits. Male and two types of female flowers are found in the figs of most species. Some species, such as the common fig used to make cookies, have male and long-stalked female flowers on some trees and short-stalked female flowers on others (4).

In order for pollination to occur an Agaonid wasp must enter through an opening, called the ostiole, at the top of the syconium. Once inside, the wasp deposits an egg in the ovary of each long-stalked flower. The ovary of the short-stalked flowers can't be reached. While laying eggs, pollen carried on the wasp's body is spread over all the flowers. Unable to leave the receptacle the wasp then dies inside (2).

Only the short-stalked flowers develop into fruits, while the wasp larvae develop in the long-stalked flowers by feeding on the seed embryo. Wingless males mature first, bite holes in the fig ovaries containing females, insert their abdomen through the holes and mate with the females. Before dying, they chew holes in the fruit through which the females later exit taking pollen with them (3). Some species may leave through the walls of the receptacle (1).

For many Ficus species, only one wasp species is responsible for their pollination. These trees "control" pollinators on a basis of ostiole size, timing of fig production and the types of attractant they produce. Other factors include the wasp's behavior and its ability to reach the ovary through the style of the flower (3).

Some trees have more than one pollinator (1). In some cases the wasp only deposits eggs, but does not pollinate the fig (4). The tree also loses if the wrong pollen is brought into the syconium, as some wasps are known to pollinate more than one Ficus species (1).

Rubber trees may live 80 or more years and reach over 100 feet tall. The wasp, 2 mm or less, may live only a few weeks once outside the receptacle. Yet both organisms have co-evolved to depend on the other for the survival of their kind. This relationship is symbiotic; both species benefit from the presence of the other. Neither can complete its life cycle without the other. It is an example of the balances and dependencies found within many of nature's ecosystems. This one, however, is one of the most easily understood.

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Getting in Touch with Nature

By
Marcia G. Taylor
Extension Specialist
Virgin Island Marine Advisory Service
University of the Virgin Islands Eastern Caribbean Center

Learning about the natural environment is more than studying the function and structure of biological communities. Classroom instruction provides basic cognitive understanding, but may fail to inspire and excite children. Traditional instruction concentrates on teaching the facts, but often fails to develop positive attitudes toward the environment, which is crucial to its survival.

The key to developing positive attitudes about our natural environment is interacting with it. Much like developing a new friendship, children must interact with, spend time with, develop a relationship with, the natural environment. When children come to know the environment rather than know about it, it will touch their souls and affect their long-term behavior.

It has been my experience that an adult's relationship with nature depends on his or her childhood experiences with nature. As a child growing up in rural Connecticut I was surrounded with by many natural playgrounds. These served as a classroom for the most important type of learning in my career as a natural resource specialist. During the many hours I spent outdoors, day after day, I learned the most important things about nature: the tranquility of a trickling brook, the mood of the forest at sunset, the peace of sitting in a tree, the unfettered joy of running in a field. These are the things which drove me to pursue a career in the natural sciences, and which motivate me today to protect nature.

As a child, being outdoors gave me a sense of peace, of freedom, and of joy. But it also gave me a sense of privacy, a place separate from the adult world. These experiences affected my life and touched my soul. They established within me a deep connection with nature which is very much alive today.

The development of a positive attitude about the natural environment is an important quality for the future leaders of this island. As adults these children will be called on to make decisions which will affect wildlife and people, and their shared home, the earth. They will need to have a healthy concern about and reverence for their island's natural resources. The survival of these resources depend on this.

Studies done on school children support the view that increasing the number of field experiences will develop positive attitudes toward the natural environment. Field work has also been shown to stimulate cognitive learning. Being excited about a subject heightens motivation and stimulates learning.

An observation or study made in the natural environment is one that the student can repeat at a later time on his own. During the summer, students can't very easily re-examine and reflect on demonstrations that were set up in the school laboratory. But they can re-visit a mangrove area where they went during a field trip. They could even share their field experience with family or friends, without the classroom. The environment becomes something familiar, something comfortable with, something real, not just another science class activity. This ability to reflect back on their own, allows better retention of the knowledge.

When students go into the field, they learn about the subject with all of the senses. They can see it for themselves, not just through books. They can hear the sounds associated with it, feel what it is like, smell it, and touch it. You can tell students that the sediment associated with salt ponds is largely organic in nature and anaerobic. Or you can take them to Cassava Gardens wetlands and let them pick it up,

see how fine the sediment is, see the half decomposed leaves in it, experience the smell and the texture, taste its saltiness. Sensations to remember.

A lot has changed since I grew up, and children no longer have the same opportunities to explore the natural world. With the steady disappearance of undeveloped land adjacent to housing, nature is becoming something remote. Children today come home from school and rush to the TV or video games instead of going outdoors. They are not providing an opportunity to develop a kinship with nature.

There are some programs on the island which seek to expose more children to the island's natural areas. This summer the Virgin Islands Marine Advisory Service (VIMAS), in conjunction with the St. Croix Environmental Association (SEA), ran the "Outdoor Adventure Week." This program exposed children to several of St. Croix's natural areas. In addition to exploring these areas and discovering the many fascinating plants and animals which reside there, the children were given quiet time to reflect about their experiences in the natural world. These field experiences start to develop appreciation and respect for the island's natural resources. Anyone can help children become better in touch with the natural environment. You don't have to be an expert in science; you just have to allow the kid in you to come out. Take them exploring and discover with them the beauty and mysteries of our environment. Take them snorkeling and on long walks. Start them on a life-long learning experience that will enrich their lives and allow them to appreciate some of the best parts of our island. Captivate them with beautiful, weird and wondrous things, so that they will want to go back with their friends and parents and preserve them for future generations. Invest in nature by exposing children to it.

Youths discovering the natural beauty and mysteries of their environment.

Physiological Response of Three Sheep Breeds to Summer Temperatures on St. Croix*

By
Dr. Stephan Wildeus and George Willock, Jr.
UVI Agricultural Experiment Station

*Data described in this report were collected by George Willock, Jr., a Central High School senior at the time, as part of a Minority Research Apprentice Program project under the direction of S. Wildeus. Mr. Willock is currently completing a degree in civil engineering at Colorado State University, Fort Collins.

A major constraint to livestock production in the tropics and subtropics is the necessity for most animals to produce efficiently outside their thermo neutral range (55-65°F). Energy that could be utilized for production (growth, milk, wool) must be diverted to maintain and control body tempera ture. At ambient temperatures exceeding 65°F, heat loss from the body by conduction is reduced and additional cooling mechanisms (evaporation from skin and respiratory tract) have to take effect. Once ambient temperature exceeds 81°F, heat loss to the environment becomes impaired and animals may respond with an increased body temperature and respiration rate, and reduced feed intake, thus decreasing production efficiency. Relative humidity, air movement and solar radiation also influence the animal's thermoregulatory response.

Breeds of livestock differ markedly in their ability to cope with in creased environmental temperatures. Breeds that have evolved or been main tained for extended periods under tropical conditions have physiologically adjusted to high environmental temperatures, but usually at a cost to their production potential. Some traits universally associated with heat adaptation are a short hair coat, a high frequency of sweat glands, reduced subcutaneous fat and a smaller digestive tract. Pelage type and coat color also may have a significant effect on an animal's ability for thermoregulation under various environmental conditions.

A project was designed to compile preliminary data on the physiological response (rectal temperature and respiration rate) of two native Caribbean hair sheep breeds (Virgin Islands White and Barbados Blackbelly) and a wool sheep breed (Florida Native). The Florida Native sheep are a recent import originating from the University of Florida at Gainesville and are adapted to the climate of the Southern region of the U.S. These breeds provided examples of both, different coat colors (white: V.I. White and brown/black: Barbados Blackbelly) and different pelage (hair: V.I. White and wool: Florida Native).

The experiment was conducted at the University of the Virgin Islands Agricultural Experiment Station on St. Croix and the animals housed at the Sheep Research Facility. Rams were used as experimental animals in order to minimize differences in physiological status usually present in the female. Rams of uniform age (approximately 12 months) and weight (approximately 70 lbs) were selected for the study.

In part one of the study, rams were maintained in pens and on pasture and rectal temperature and respiration rate were recorded at 0900 and 1200 hours for a five-day period. Rectal temperature was determined in the restrained animals via a digital veterinary thermometer, while respiration rate was determined in unrestrained rams by visual assessment of flank movement (average of two 15-second measuring periods). Ambient temperatures were recorded at the time of measurement.

There were significant differences between the three breeds and the time of day of measurement in both rectal temperature and respiration rate (Figure 1). At 0900 hours no difference was observed in rectal temperature (103.5°F) between rams of the three breeds, but rectal temperature increased at noon and was highest (104.9°F) in the Florida Native rams. Respiration rate differed between the three breeds at 0900, being highest in the wool rams (113 respirations/min) and lowest in the V.I white rams (64 respirations/min). Respiration rate increased from 0900 to 1200 hours in both the Florida Native and V.I. White rams, but not the Barbados Blackbelly rams which also had the smallest increase in rectal temperature. Respiration rate and rectal temperature were closely correlated (r=.601). The average ambient temperature during the five-day period was 85.6°F at 0900 hours and 89.5°F at 1200 hours. There was a good positive correlation of ambient temperature with rectal temperature (r=.410), but not with respiration rate (r=.238).

In part 2 of the experiment the same rams were used to study the effect of moderate shade on rectal temperature, respiration and water intake. Rams were confined in a 2.5'x4.0'x2.5' cage and placed in the open, either with or without a 60 percent shade cloth cover. The shade cloth was located 10 feet over the cages and provided shade throughout the day without restricting airflow. Rams were allowed to

adjust to the cage for one day before measurements were taken on the second day. Ambient temperature at pen level, rectal temperature and respiration were recorded at 0900, 1200 and 1500 hours. In addition 24-hour water intake was monitored.

Shade did not affect ambient temperature at pen level (86-88°F), as had been expected, but was similar between the two treatments. However, there was a small increase (86 to 88°F) in pen temperature between 0900 and 1200 hours. No difference in rectal temperature and respiration rate were observed between the two treatments. The three breeds again differed in rectal temperature and respiration rate (Figure 2), as was observed in part one of the experiment. In contrast to part one, however, time of day had no influence on rectal tempera ture and respiration rate, which may be the result of the lower ambient tem perature at noon in the second part of the experiment. Water consumption of rams was reduced by 7.5 ounces (Florida Native) to 27 ounces (V.I. White) under the shaded conditions (Table 1) compared to non-shaded conditions. The reduction in water consumption under shaded conditions was more pronounced in the hair (32-42 percent) than the wool rams (13 percent).

The experiment demonstrated some of the adaptive advantages of the hair sheep over the wool sheep under summer conditions on St. Croix. The wool rams, although adapted to Florida temperatures, experienced a higher degree of heat stress as indicated by the increased rectal temperature and respiration rate. No consistent differences were observed between the dark-colored Blackbelly and the white V.I. rams, suggesting that coat color is of no particular consequence under St. Croix conditions. Under the prevailing temperatures at the time of the experiment (88°F), the animals appeared not to be sufficiently heat-stressed to need shading to maintain body temperature. However, the increased water consumption by non-shaded animals indicates that they required a higher level of sweating and respiratory evaporation, particularly at noon, to maintain body temperature.

These preliminary results form the basis for further, more detailed, studies evaluating adaptation of hair sheep genotypes to the local environmental conditions. This information can than be used to design more efficient management systems and structures for sheep production on St. Croix.

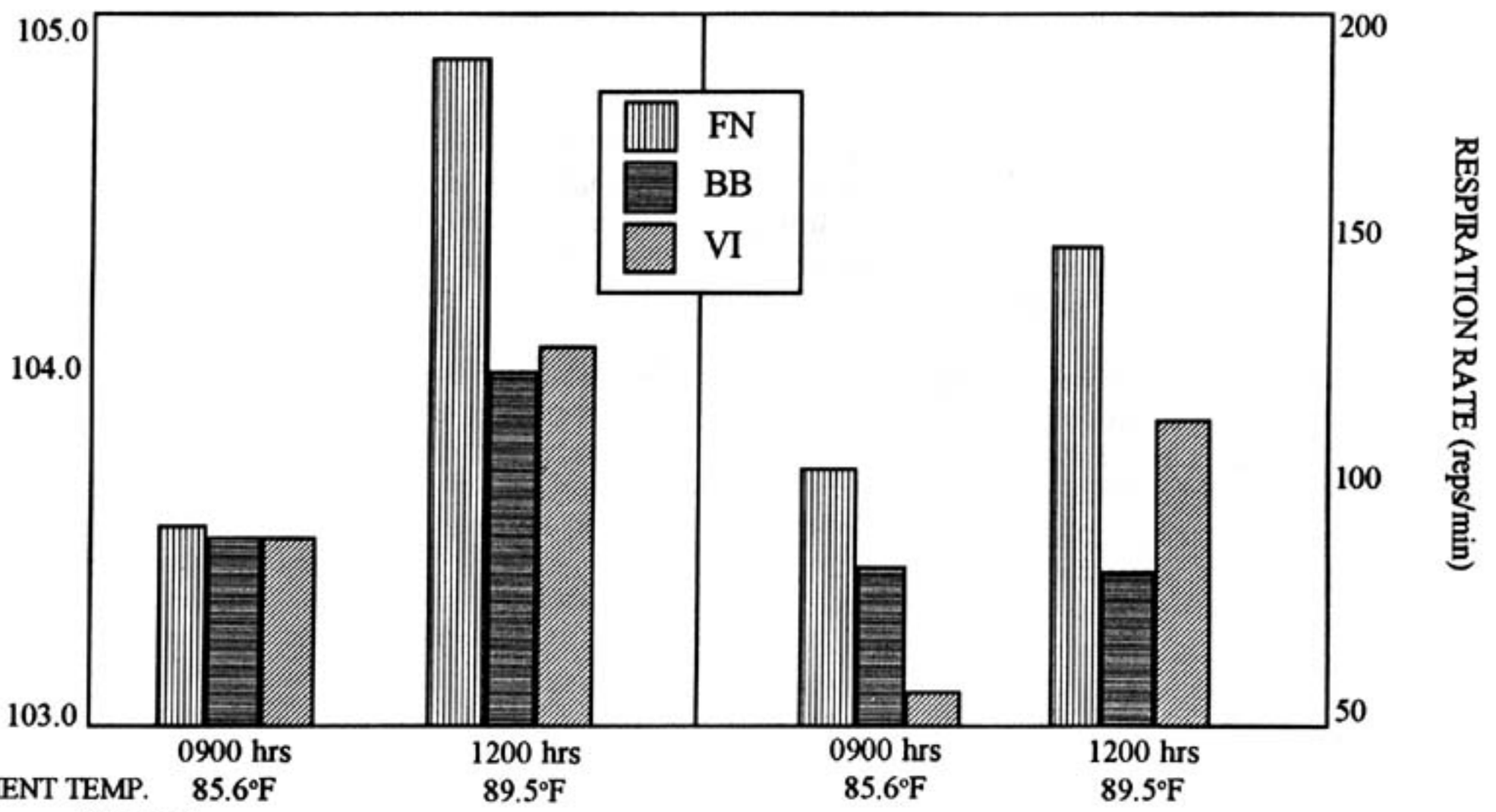


Figure 1
Rectal temperatures and respiration rates in Florida Native (FN), Barbados Blackbelly (BB) and V.I. White (VI) rams 0900 and 1200 hours over a 5-day period.

Table 1
Water consumption (24 hour period) in Florida Native (FN), Barbados Blackbelly (BB) and V.I. White (VI) rams under shaded and non-shaded conditions.

	FN	BB	VI
Water consumption (oz)			
non-shaded	57.0	59.3	64.5
shaded	49.5	40.5	37.5

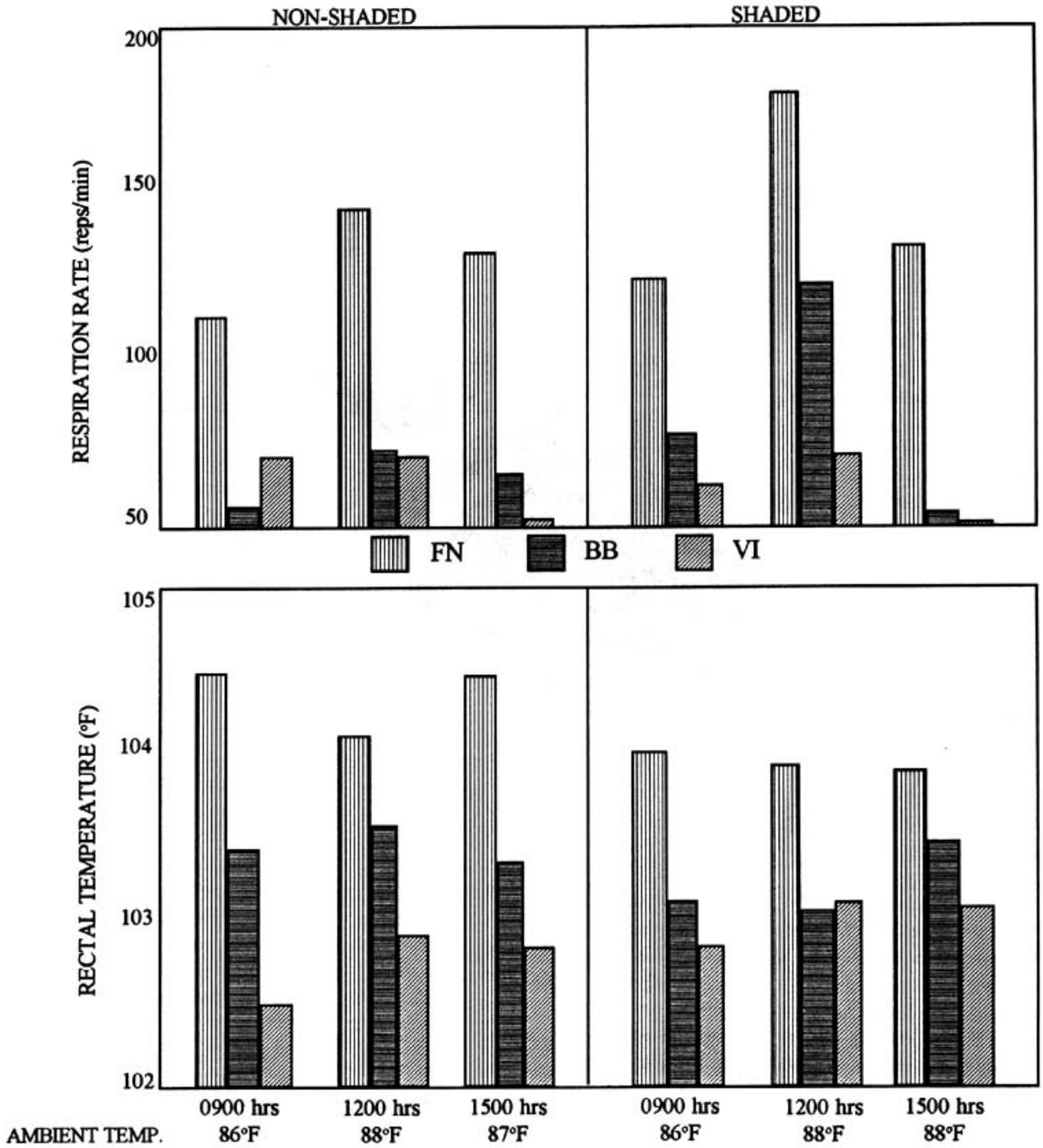
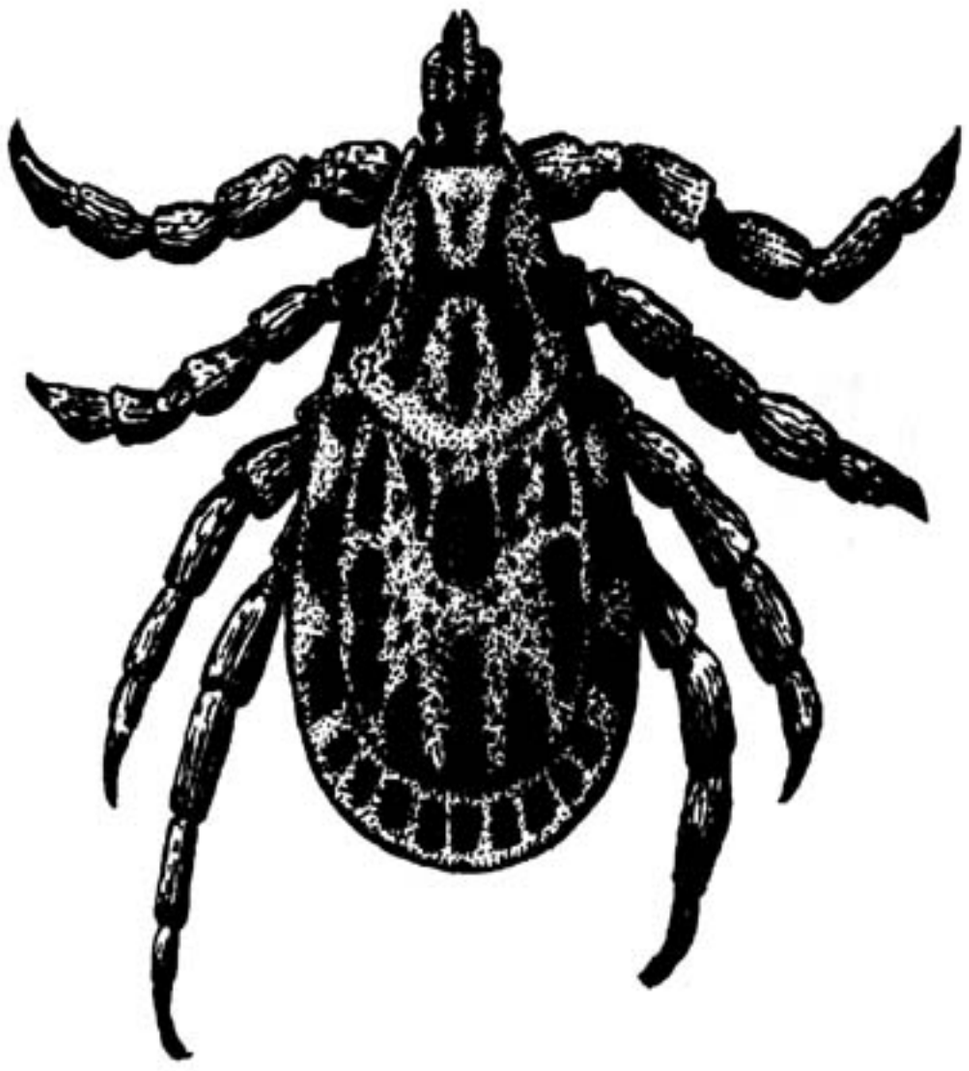


Figure 2
Rectal temperatures and respiration rates in Florida Native (FN), Barbados Blackbelly (BB) and V.I. White (VI) rams at three times during the day under shaded and non-shaded conditions.

Ticks In The Virgin Islands

By
Duke Deller, DVM
Director of Veterinary Services
Department of Economic Development & Agriculture

Tropical ticks abound in the Virgin Islands and are a health threat to cattle, horses and dogs. Fortunately, we have no ticks that carry diseases transmissible to humans (such as Lyme Disease, Rocky Mountain Spotted Fever or Tick Typhus).



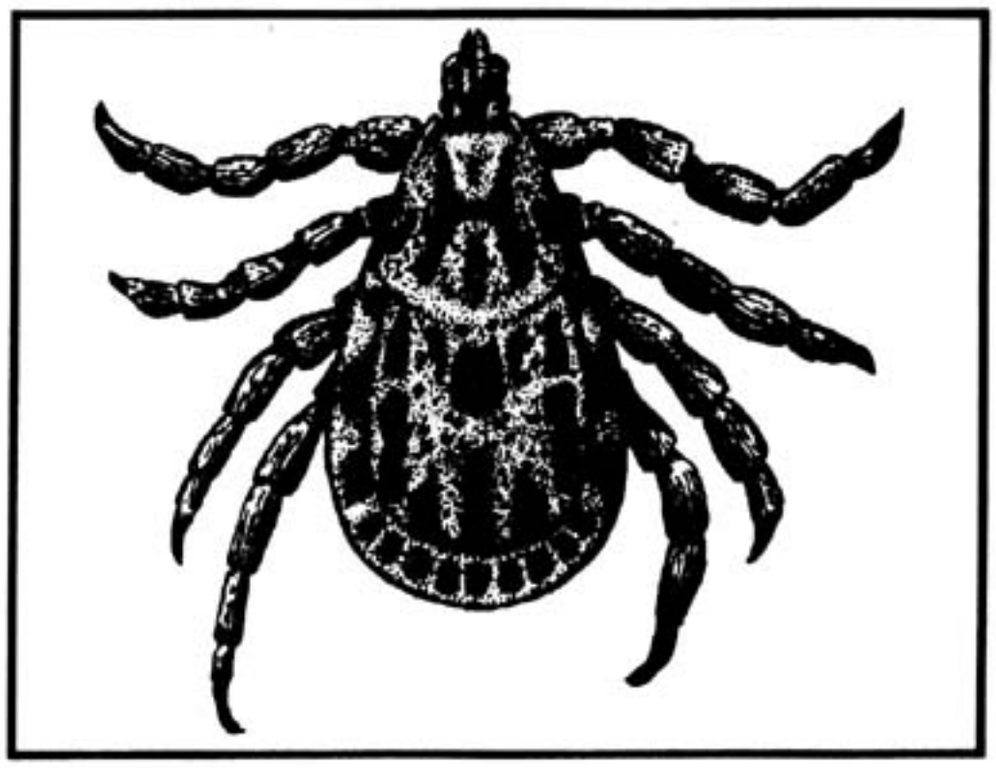
The greatest losses from tick diseases occur in cattle. Boophilus microplus carries Babesiosis (Piroplasmosis) and Anaplasmosis in cattle which infect the red blood cells causing destruction. Susceptible animals may experience sudden death from a shock-like syndrome, becoming weak, disoriented and sometimes belligerent before death. Less susceptible animals become anemic and dehydrated and lose considerable weight. They may also have a tendency to become slightly bloated and constipated due to rumen and intestinal stasis.

The Boophilus tick has a three-stage life cycle. Eggs are laid by the female in the ground. In seven to ten days, the eggs hatch out small larvae or seed ticks which climb on the grass and wait for passing bovine species. Once on the cow, they feed on blood three to five days, moult into a nymph that feeds another five to six days, and then moult into an adult that also feed five to seven days. The engorged females are about the size of the end of one's index finger. they lay from 2,000 to 4,500 eggs.

Horses are plagued by Dermacentor Nitans, the tropical horse tick which carries Piroplasmosis and probably Ehrlichiosis. Both are diseases of the red blood cells which cause serious illness in horses, although neither is usually fatal.

Rhipicelphalus Sangueneus is the brown dog tick that propagates very well in the tropics. The tick can also live on cattle and horses. The tick can carry Biroplasmosis and Erhilichiosis in dogs. Erhlichiosis in dogs is commonly called "the bleeding disease" and occurs frequently in the Virgin Islands. In typical cases, dogs become febrile, lose hair and appetite, become dehydrated, and start bleeding from the nose. In more chronic cases, dogs become thin with mattery eyes and may have muscle soreness with red blotches, bruised spots of hemorrhage under the skin. Piroplasmosis in dogs appears to be rather rare in the Virgin Islands, manifested by anemia, jaundice, fever, depression, loss of appetite and weight loss linked with dehydration.

Ticks must be destroyed before they can lay more eggs. They can be controlled by dipping the animals every two weeks. With dog ticks, the nymphs larvae crawl up into the rafters and ceiling, so these areas must be sprayed also to effectively control the ticks. For more information, call Duke Deller at 778-0997.



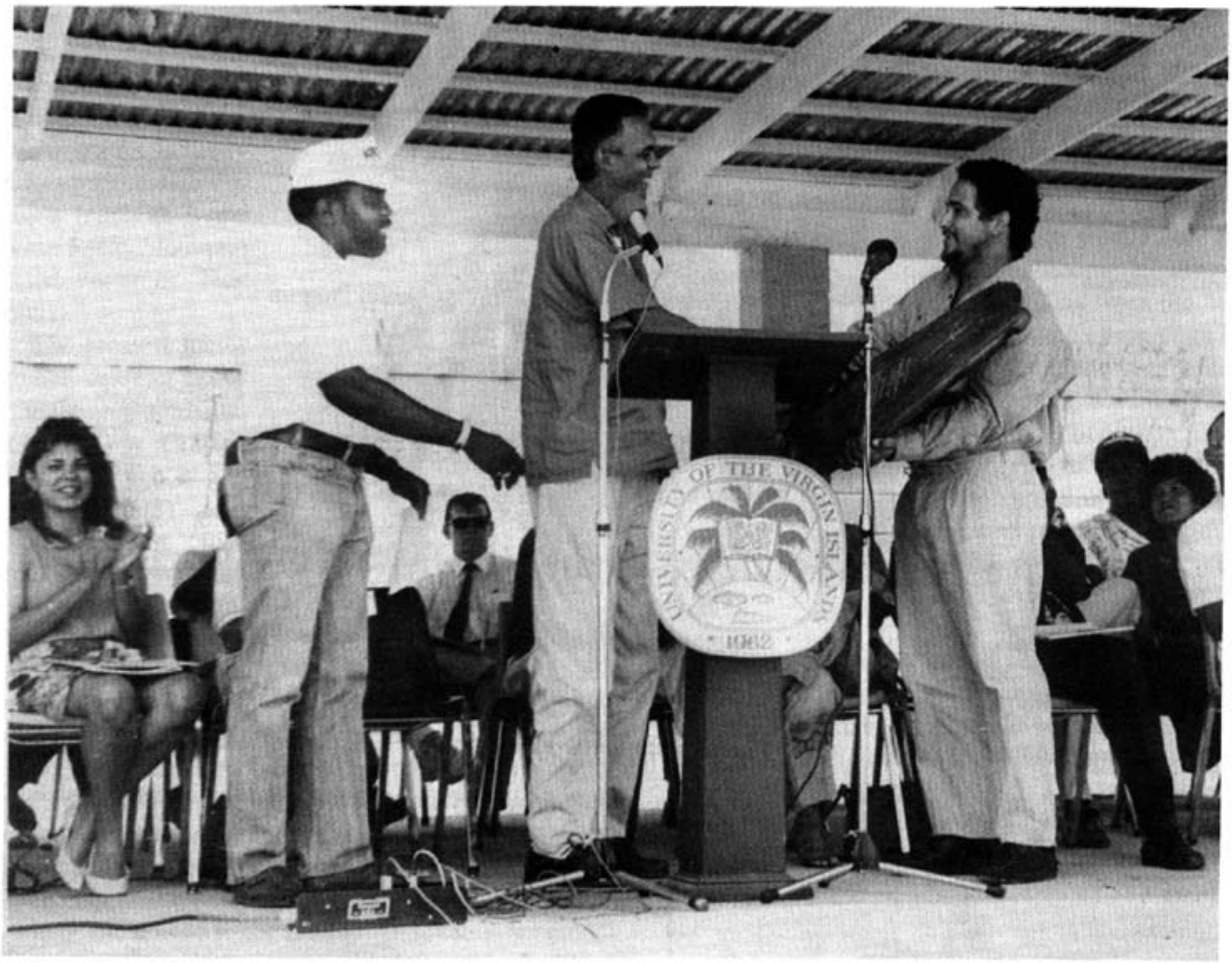
UVI-CES Educational Projects offered to the V.I. Community

PROGRAM AREAS	PROJECTS
Agriculture	–Urban Gardening –Sustainable Agriculture in the Virgin Islands Beef Production Dairy Production Small Livestock Production Pasture and Forage Development in the Virgin Islands Integrated Farm Management Systems in the Virgin Islands
Community and Rural Development	Extension Information Dissemination Virgin Islands Extension Exhibitions/Fairs
4-H	Volunteer Development and Management 4-H Club System 4-H Youth Summer Camp Program Youth at Risk
Home Economics	EFNEP- Nutrition Food Safety and Quality Limited Resources/Low Income Individuals/Families Parenting & Family and Family Youth Programs Improving Diet, Nutrition and Health Developing Marketable Skills
Natural Resources	Environmental Education Virgin Islands Comprehensive Water Quality Program Soil and Water Conservation
Pest Management	Integrated Pest Management Pesticide Impact Assessment Virgin Islands Pesticide Applicator Training
International Outreach	Eastern Caribbean Extension Outreach and Interchange

Incentive Programs offered by the V.I. Division of Agriculture

Farmland Tax Exemption	This program offers 95% tax exemption on land used for farming.
90% Subsidy to Farmers	Qualified farmers are given a 90% rebate on taxable income.
Soil Conservation Services	Construct farm ponds or dams for water storage or retention at no cost to farmers.
Animal Health Care	Our Veterinary Health Program assists in combating and controlling animal diseases in the Virgin Islands.
Abattoirs	Provide slaughtering services under the USDA Inspection. This insures consumers wholesome meat.
Horticulture Nursery	— Fruit trees, packaged seeds and a variety of slips and vegetable seedlings are made available to our farming citizens.
Land Preparation	Assist farmers in the preparation of land for farming.
Molasses	Provide farmers with molasses which increases the palatability of poor quality roughage feed.
Hay Baling	The Division bales hay and makes it available to our livestock farmers.
Cost Sharing	This program shares in the cost of producing fruits, vegetables, animals and other agricultural practices.
Farmers and Fishermen Exemption from Tax and License Fees	Under this program, farmers and fishermen are exempted from payment of trade or excise taxes, franchise taxes and license fees.

Farmer of the Year
1992



Mr. Angel Luis Gonzales received the Farmer of the Year Award for his years of dedication as a livestock farmer from Lieutenant Governor Derek M. Hodge and Kofi Boateng, (right), UVI-CES Livestock Specialist and Fair Director.

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