12th ANNUAL AGRICULTURE and FOOD FAIR of the VIRGIN ISLANDS 1982

JOINTLY SPONSORED
BY
THE V. I. DEPARTMENT OF AGRICULTURE
AND
THE COLLEGE OF THE VIRGIN ISLANDS
COOPERATIVE EXTENSION SERVICE
AGRICULTURE EXPERIMENT STATION

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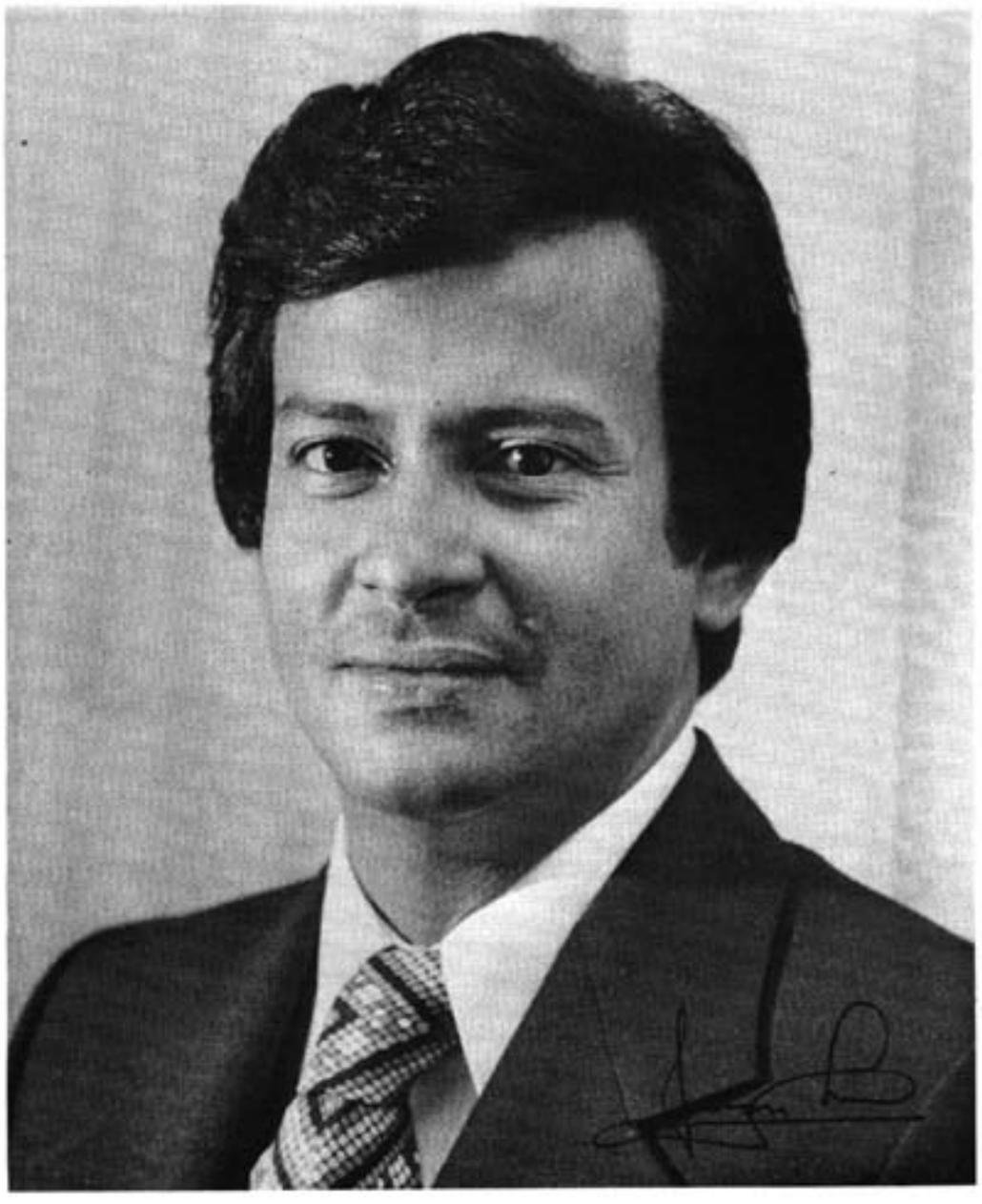


THE VIRGIN ISLANDS OF THE UNITED STATES

OFFICE OF THE GOVERNOR

Charlotte Amalie, St. Thomas, U.S. Virgin Islands

Message from Honorable Juan Luis
Governor of the Virgin Islands

Once again it is a special pleasure to welcome the annual Agriculture and Food Fair here in St. Croix -- the twelfth year that this event has been held. My heartiest congratulations to everyone whose dedication has contributed to this entertaining and educational fair, especially the hard-working farmers and the board and committee representing the two sponsors, the Virgin Islands Department of Agriculture and the College of the Virgin Islands Extension Service.

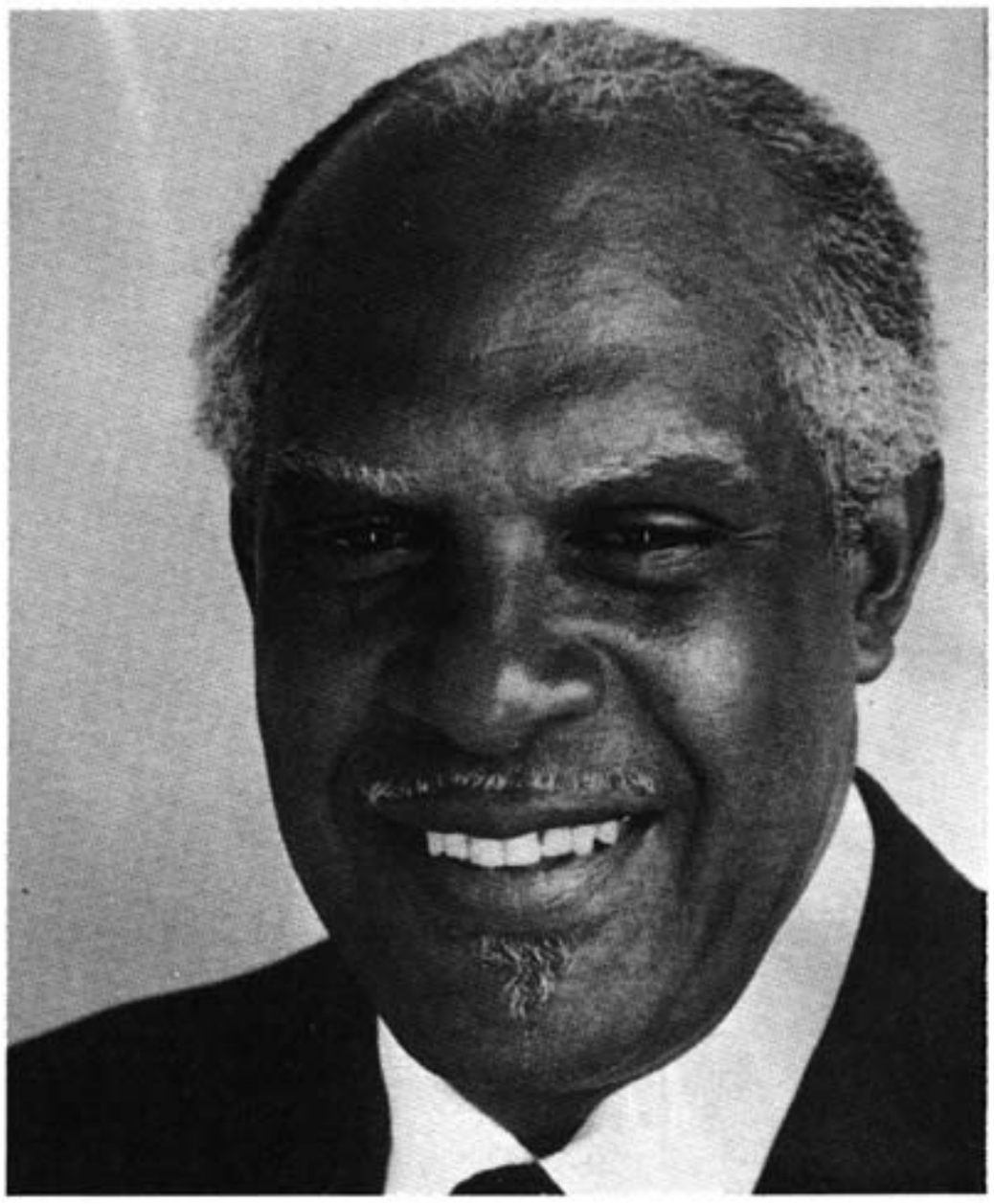
The theme this year is apt: Grow More Food in '82' -- Eat Well and Preserve Some Too. It is heartening to note the increase each year in the number of people who participate in growing some food, as a means of saving and especially of eating a more healthful and flavorful diet. Most of these growers have enough bounty to put some aside for the future in the form of our especially flavorful Virgin Islands preserves, pickles and other good recipes that are being shared with everyone at the fair this year.

Agriculture continues to be a high priority in my Administration and I am pleased that the higher budgets for which I have fought are paying off in the arrival of new equipment for all three islands with which the Department of Agriculture can assist farmers and home gardeners and in the development of more land for agriculture purposes. Cooperation among government departments has led to, among other things, the initiation of energy-saving projects for agriculture such as the use of energy from our abundant trade winds through windmills. These and other projects will continue to receive heavy support and subsidy from my Administration.

A legistative goal high on the list for this year is the development of marketing potential and a viable marketing strategy for agriculture in the Virgin Islands. This will greatly assist in the overall economy, which must be more diversified during these times of worldwide recession.

On behalf of the people of the Virgin Islands, I commend all the participants and organizers of the Twelfth Agriculture and Food Fair and wish you continued success as you strive for a viable agricultural program for the Virgin Islands.

Juan Luis
Governor



Message from Commissioner Rudolph Shulterbrandt
President of the Agriculture and Food Fair

Once again I have the pleasure of welcoming you to our 12th Annual Agriculture and Food Fair. Our motto "Grow More Food in '82, Eat Well and Preserve Some Too" should serve as an appropriate stimulus for addressing a most important need of our islands. The problems of adequate food are world-wide and a major concern of almost all mature persons wherever they may live.

There are some who daily wish that they did not have to eat or could just forget food and get by without eating. This may be so because of dietary restrictions or limitations, the high cost of food, or the desire to lose weight. Fasting or hunger strikes have personal justification or application, but to the great majority of us, after five or six hours of fasting the pangs of hunger soon remind us that food is a required necessity.

It is projected that by the year 2000 the population of the world will double, but the land for agriculture will not increase to meet the needs of an increasing population. Food shortages and starvation are now being experienced and millions are starving and even dying in certain parts of the world.

It is rather unfortunate that the world power nations who are spending billions of dollars for weapons of destruction or so-called defense, could not be channeling this money to food production systems or for other life proionging needs which will lead to increased health and happiness. It is also unfortunate that here in the Virgin Islands, agriculture has such a low priority that we have not been able to purchase some of the idle acres of land for food production, but we are able to find the money to meet crises as they occur in other areas.

It should not be too difficult to perceive the phenomenon of the rapidly increasing population versus the decreasing land areas for food production. We should not allow this to happen here. We must increase our acreage of farming in the Virgin Islands. In this regard, I am urging you to follow the motto of this fair: "Grow More Food in '82, Eat Well and Preserve Some Too."

As you observe the activities of the fair this year, be sure to pay special attention to the demonstrations on canning, freezing, and drying. You may find one of these methods of food preservation handy in the near future.

Enjoy our 1982 Agriculture and Food Fair!

COLLEGE OF THE VIRGIN ISLANDS
OFFICE OF THE PRESIDENT
Charlotte Amalie, St. Thomas, U.S. Virgin Islands

Message From Dr. Arthur A. Richards
President, College of the Virgin Islands

The 1982 Agriculture and Food Fair theme, "Grow More Food in '82--Eat Well and Preserve Some Too" is particularly appropriate as an expression of an important priority direction for all island residents. With new energy crises looming on the horizon which threaten the tenuous lifeline of food importation by ocean transport and air cargo lines, and with the cost of food rising daily, we in the Virgin Islands must address ourselves to the imperative for increased food production at home.

This year's Fair theme is closely allied with the continuing goals of the College of the Virgin Islands which are to provide our community with the best in academic instruction, research and public service. Continual emphasis is being placed on strengthening our teaching program in agriculture as an important aspect of our goal commitments. Our research programs have already reached a stage of reliable credibility in the community and the main thrust of the College's extension service activities are well known.

Presently the research being conducted by our Agricultural Experiment Station in horticulture, agronomy, pest management, animal science and aquaculture are directed chiefly toward providing information to our residents about the best food crops to cultivate for their tables and the best feed crops to grow for livestock. Assistance to local dairymen and livestock producers is aimed at increasing production efficiency. Our work in aquaculture is aimed at encouraging the potential of augmenting our table protein with homegrown freshwater fish.

Bringing this information to the people in a practical and easily applicable way is the task of our Coopertive Extension Service which goes out to the community to demonstrate the results of our research to farmers, gardeners, homeowners, housewives, and island young people. Whether it be problems with insects on crops, learning how to propagate fruit trees or how to start a garden, or learning about the best methods to preserve your produce, the extension staff is there to offer assistance and demonstrate the best techniques to achieve increased self-sufficiency.

The College of the Virgin Islands is dedicated not only to provide service to our community here at home, but to the Caribbean at large. As president of the College, I have committed myself to develop CVI as a center for educational, technical, and cultural interchange with the eastern Caribbean. Our land-grant programs will play a very important role in this new outreach effort.

I would like to commend the board of directors of this year's Fair as well as others who contributed so much time and effort toward making this Fair the success that it always is. The Fair has become an important tradition in our island community and I urge Virgin Islanders to visit all of the exhibits, but in particular, our CVI booths which demonstrate our goals and efforts.

★★

AGRICULTURE AND FOOD FAIR ADMINISTRATIVE STAFF – 1982

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WORKING TOGETHER F

V.I. DEPARTMENT OF AGRICULTURE
By Commissioner Rudolph Shulterbrandt

The Virgin Islands Department of Agriculture and the Cooperative Extension Service of the College of the Virgin Islands have branches on the three Virgin Islands - St. Croix, St. Thomas and St. John. On St. Croix, the major agricultural island, these two agricultural agencies are less than one-half mile apart on the centerline road, approximately in the center of the island.

Though these agricultural agencies serve agriculture in different ways, their goals are the same. That is, to serve the agricultural interest of the islands to assure that the maximum potential of agriculture will be attained. It does not matter if it is a new farmer or an old established farmer, he will still need the service of these two agencies in some way.

The Virgin Islands Department of Agriculture has developed its organization based on areas of necessary agricultural service or basics. Our organization is not geared to produce food for self-sufficiency of the islands. That is not the policy of our government. Rather, we exist to help others produce food by serving most of the island farmers who utilize our services in many ways.

If a farmer wants to know what variety of tomato or melon to plant, or what varieties will perform best on the islands, he should call on the Cooperative Extension Service for this assistance. They have already conducted the scientific research to develop this type of information. However, suppose after receiving the desired information the farmer needs to have his land prepared to enable production of the crop, and he does not own the necessary equipment to prepare his own land: he will have to turn to the Virgin Islands Department of Agriculture to fulfill this need. After the land has been prepared for planting, the farmer will again come to the Department of Agriculture for the necessary slips, seeds, or seedlings. Since it is almost impossible to produce certain vegetable crops without some application of an insecticide, the farmer must again turn to the Cooperative Extension Service for the proper identification of the pest, and the most effective control.

The foregoing is the basic relation between the Virgin Islands Department of Agriculture and the Cooperative Extension Service of the College of the Virgin Islands. Both organizations work together to provide the effective technology and service to the Virgin Island farmer.

The following are the services offered and rendered by the Virgin Islands Department of Agriculture:

1. **LAND PREPARATION**
   a. Land Clearing
   b. Plowing
   c. Harrowing (Refinement)
   d. Banking

2. **SOURCE OF SEEDS, SEEDLINGS, AND FRUIT TREES**

3. **PESTICIDES**
   a. Horticultural Spraying
   b. Livestock Spraying or Dipping

4. **VETERINARY SERVICE**
   a. Livestock
   b. Regulatory Inspection and Surveillance

5. **ABATTOIRS**
   a. Slaughtering and Wholesome Meats Inspection
   b. Egg Inspection Service

6. **FORESTRY**
   a. Reforestration Program
   b. Tree Trimming
   c. Nursery Administration

7. **POULTRY AND SWINE SUPPLYING**

8. **LIVESTOCK ROUGHAGE PROGRAM**
   a. Hay Making
   b. Green Chop Feed

9. **SOIL AND WATER CONSERVATION SERVICE**
   a. Farm Pond Drainage
   b. Drainage Ditches
   c. Terrace Construction

10. **MARKETING ASSISTANCE**

11. **ASSISTANCE WITH TAXES AND OTHER INCENTIVE PROGRAMS**

12. **COMMUNITY GARDEN ADMINISTRATION**

If you are a farmer in need of assistance in any of the above needs, the Virgin Islands Department of Agriculture will use its available resources to assist you.

FOR ISLANDERS ...

C.V.I. LAND GRANT PROGRAMS
By Director Darshan S. Padda

The Annual Agriculture and Food Fair stands as a concrete example of what can be achieved by the efforts of various public agencies working together for the benefit of the people of the Virgin Islands. Under a limited resource situation such as ours, multiplication of expertise through joint projects is absolutely essential. Neither the V.I. Department of Agriculture nor the Cooperative Extension Service has the capability of organizing and managing such a high quality event alone. But working jointly we have not only succeeded in providing educational exhibits to our farmers and homemakers but have offered the general public a three-day sociocultural function. We hope this years' fair will receive the same acceptance from our people as has been in previous years.

We, at the College of the Virgin Islands under the leadership of President Richards feel committed to work with other public agencies and particularly with the V.I. Department of Agriculture since mutual endeavors, if pursued vigorously and sincerely, can greatly enhance our quest for increased food production in the islands and the ultimate realization of our hopes for self-sufficiency in food production. The technology developed by the CVI land grant staff is made available to the agriculture department in many areas including information on recommended varieties and cultural practices of crops suitable for the Virgin Islands climate and soil conditions; proper pesticides for use on crops and livestock; and assistance with beef and dairy cattle and smaller livestock.

The fair is only one of various methods that the extension service at CVI uses to reach our diversified clientele with educational information on farming, home gardening, home economics, 4-H and youth, and community and rural development.

The Cooperative Extension Service is a part of the land-grant system at the College of the Virgin Islands. The other two parts of the system are (1) the **agriculture teaching program** that offers curriculum leading to an Associate in Arts degree in Agriculture, and (2) the **Agricultural Experiment Station** which serves as a local research base to provide extension with the latest technologies to be transferred to the public. The Cooperative Extension Service, therefore, is a technology transfer agency. It is organized with four main programs and the technical services they offer are as follows:

1. Agriculture and natural resources offers assistance in the areas of kitchen gardening, vegetable production, fruit production, livestock production, irrigation, pest control, pesticide use and certification.

2. Home economics programs offer assistance in food preparation, nutrition and health, clothing construction and crafts, consumer education, family development and personal growth, and housing and home improvement.

3. 4-H youth programs offer services in the areas of leadership development, practical skills for self reliance and production, ecology, interpersonal skills, cultural identity, and organization development and maintenance.

4. Community and rural development programs offer assistance in business management and economics; government operation and finance, rural development, agricultural energy, and cooperatives.

These services are provided through individual contacts, field visits, seminars and workshops, teen-age classes, 4-H clubs and annual 4-H summer camp. The Cooperative Extension Service reaches approximately 50,000 people every year.

The **Agricultural Experiment Station** conducts basic and applied research to support these educational services through the following projects:

1. Improvement of vegetable production in the Virgin Islands.

2. Improvement of fruit production in the Virgin Islands.

3. Irrigation research on minimum water requirements for important tropical crops.

4. Development of papaya resistance to diseases.

5. Sorghum production for grain, silage and forage in the Virgin Islands.

6. Selection of superior forage grasses and management practices for the Virgin Islands.

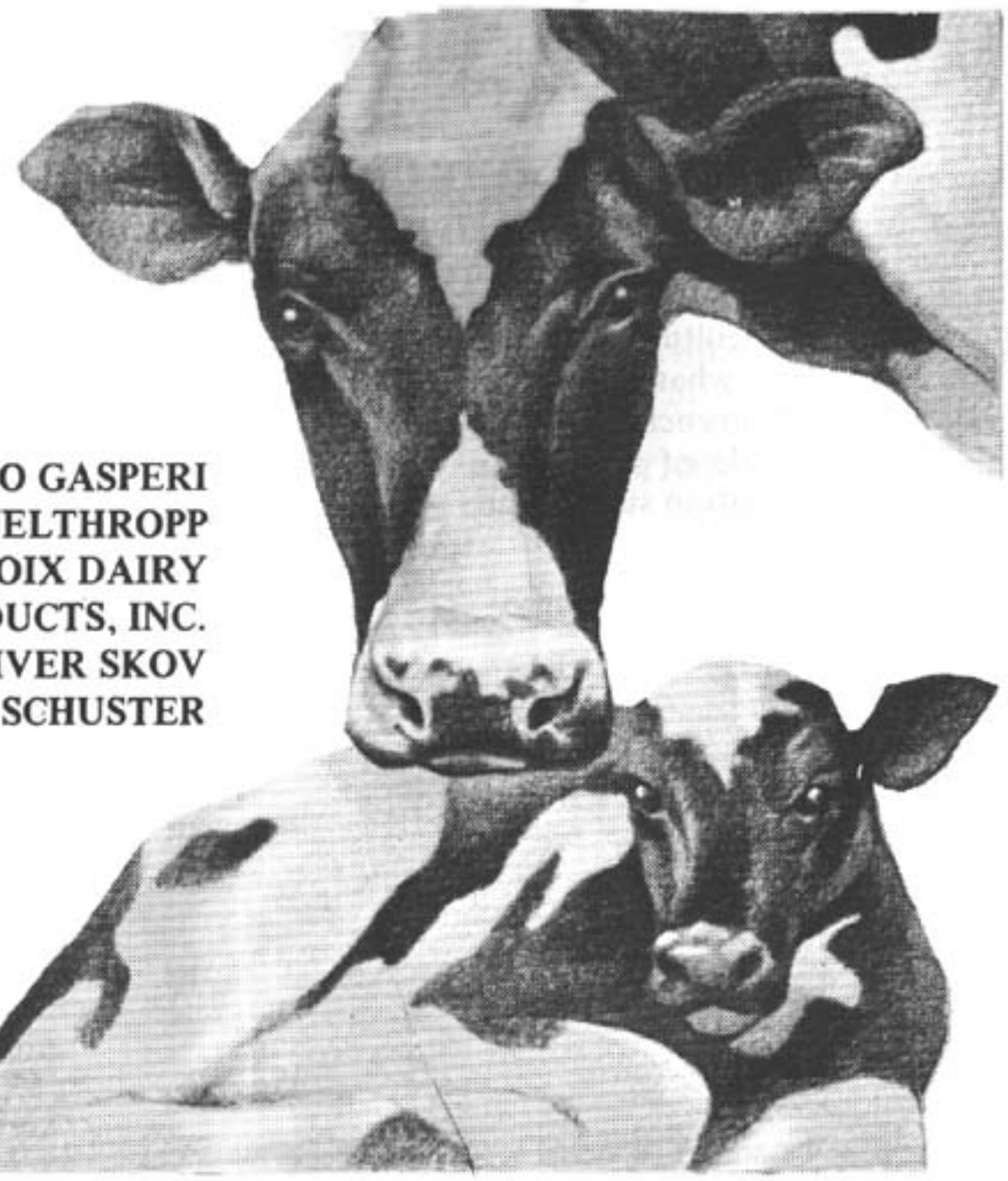
7. Breeding methods for beef cattle-Senepol development.

8. Development of culture techniques for freshwater fish.

9. Studies and research on ciguatera fish poisoning in the Virgin Islands.

10. Pesticide impact assessment.

For additional information please call the following numbers: St. Croix Extension Service 778-0246; St. Thomas Extension Service 774-0210; St. John Extension Service 776-6492; Plant Science Research 778-1043; Animal Science Research 778-0050.



CASTLE - NUGENT FARMS . . . . MARIO GASPERI
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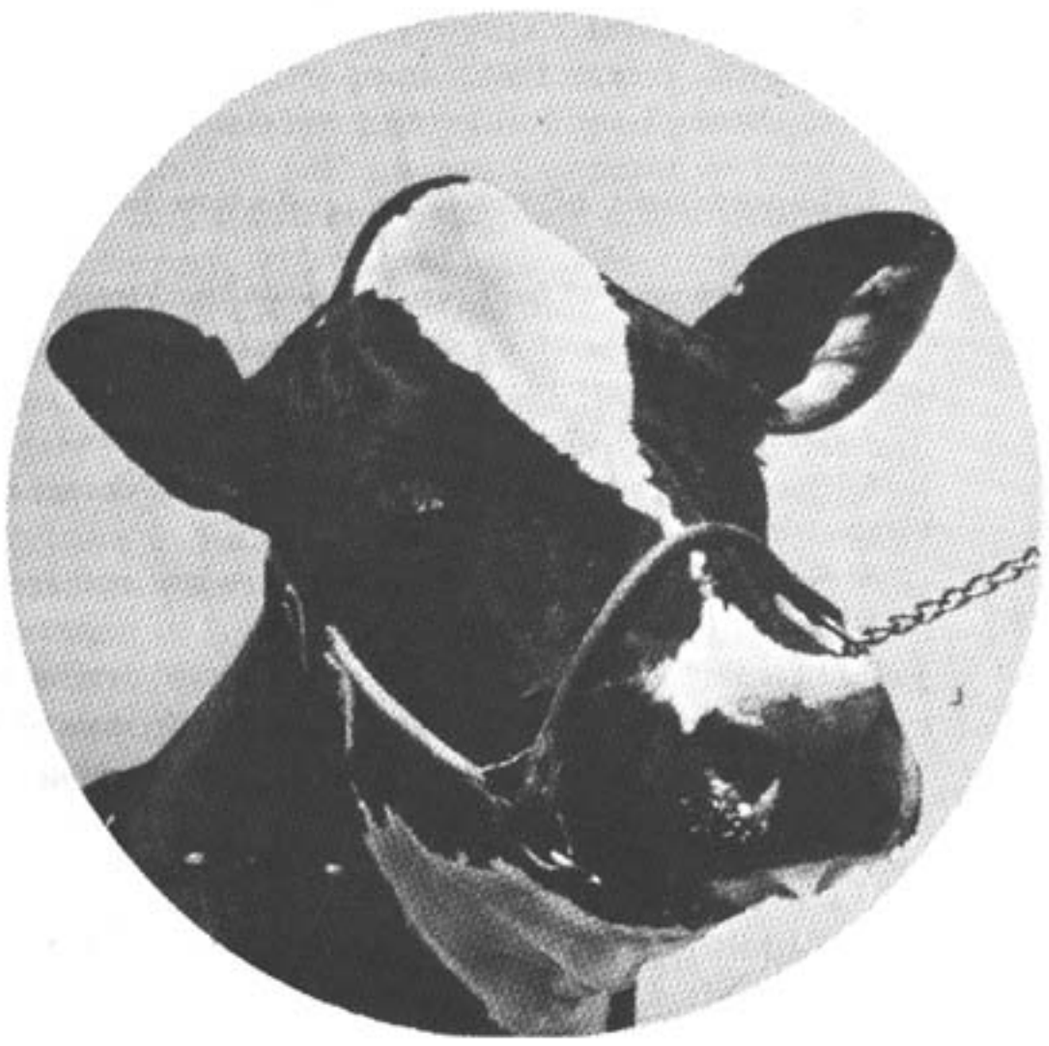
WINDSOR FARM. . . . . ST. CROIX DAIRY PRODUCTS, INC.
MON BIJOU FARM . . . . . OLIVER SKOV
SIGHT FARM. . . . . CHARLES SCHUSTER

VIRGIN ISLANDS DAIRYMEN'S ASSOC.



Fresh Grade "A"

Milk

For Your Table

Milk - A Bargain at Any Price

By Harold Hupp
Livestock Specialist
C.V.I. Cooperative Extension Service

Milk is a nearly perfect food that all female mammals feed their newborn young until the young are able to eat solid foods. Man has learned to "harvest" milk from many different mammals for his consumption. The dairy cow is a very efficient "milk factory" that converts forage and grain into a nutritionally balanced food. Throughout the world man gets milk from other sources such as goats, sheep, reindeer, llama, yak, camels and water buffalo. According to the definition of milk used by the Food and Drug Administration (FDA, 1978) "milk is the lacteal secretion, practically free from colostrum (first milk) obtained by the complete milking of one or more healthy cows." This article is meant to inform the reader about the nutrient value of milk and dairy products. The article will also familiarize the reader with the various dairy product terminology.

Nutritional Value of Milk

Milk is considered one of nature's nearly perfect foods because it has the majority of substances essential for human nutrition. Milk not only nourishes the young but it also can be used to balance diets for humans of all ages. The body requires water, carbohydrates, fats, minerals, proteins and vitamins for proper growth and development and milk has all of these components.

Milk is about 87% water. The water carries all of the other major components of milk, though liquid milk has a very high concentration of food solids compared to other food stuffs. Carbohydrates (4.9% of milk) are the major source of energy and also help in the body adsorption of calcium and phosphorous. The major source of carbohydrates in milk is lactose or milk sugar. Fats comprise about 3.5% of milk and provide energy and the rich milk taste. Milk fat also provides certain essential fatty acids the body needs to generate body tissue. Milk fat contains fat soluble vitamins A,D,E,K. Minerals (0.7% of milk) help the body grow and keep healthy. As the primary source of calcium and phosphorous for bone development, milk includes smaller quantities of potassium, sodium, sulfur, aluminum, copper, iodine, iron, manganese and zinc. Three and a half percent of milk is protein which is essential for proper growth and tissue maintenance and can also be used for energy if necessary. Proteins are made of amino acids which are the building blocks for blood and tissue.

Vitamins, as we know, are essential for proper growth, body health and the prevention of certain diseases (i.e. beriberi and rickets). Milk has adequate supplies of more vitamins (A, B_1, B_2, B_6, B_{12}, C, E, K and niacin) than in most other single natural foods. Since milk contains low levels of Vitamin D, most processing plants add vitamin D to the milk to bring it up to adequate levels. Additional components of milk include at least 20 enzymes that have been isolated from milk and the activities of an additional 15 enzymes have been reported. These enzymes are not of nutritional importance. However, they are important because some pose problems during the production, storage and processing of the milk.

Although some foods have more individual nutrients than milk, very few can compare as a source of as many nutrients of milk. According to the FDA guidelines one serving (240ml) wil have 10% or more of the U.S. Recommended Daily Allowance (RDA) for protein, riboflavin, niacin, calcium, vitamin D and B_{12}, phosphorous and iodine.

From the Farm to the Table

The raw milk produced by the cow is a highly perishable product because harmful bacteria grow rapidly and some enzymes start to decompose the milk unless the milk is kept cool and clean. Methods have been developed to extend the useful shelf life of the whole milk. Virgin Islands and U.S. departments of agriculture have

set health and cleanliness standards for the V.I. dairy farms and the milk processing plant. The dairy farms and milk plant are monitored by the V.I. Department of Health to make sure minimum health standards are maintained for all Virgin Islanders.

Milk for human consumption is classified according to the sanitary quality as either Grade A (fluid or market milk) or Grade B (manufactured milk). The Grade A Pasteurized Milk Ordinance (U.S. Public Health Service, 1965) sets guidelines for the dairy industry in the Virgin Islands to follow with reference to milk and its products. The USDA requirements for manufacturing milk (i.e. reconstituted milk) are generally less strict than for Grade A milk.

The dairy industry on St. Croix according to the last census, is generating nearly 65% of all gross agricultural receipts in the Virgin Islands. This industry is providing the Virgin Islands with a fresh wholesome product. The fresh milk produced by these dairies is only meeting about 85% of total consumption for St. Croix. St. Thomas is almost exclusively using reconstituted milk.

At the dairy farm, the milk is stored in a bulk tank at about 40° F. A tanker truck takes the milk to the processing plant where a sample is taken and sent to the plant laboratory for fat and bacteria tests. The milk is held in a storage tank until it can be clarified, pasteurized, homogenized and bottled. The bottles or cartons of milk are kept in a cold storage room until transported to the retail outlets for sale.

Milk is passed through the above processes to assure a quality product reaches the consumer. Clarification uses centrifugal force to remove all of the heavy particles from the unprocessed milk. Pasteurization is a process where the milk is heated to a specified temperature for a specified time then cooled for storage and processing. This process kills all the microorganisms and enzymes that cause spoilage and disease. Homogenization is a process where the fat particles are broken into smaller particles so they will recombine later to float on the milk.

Dairy Products and Terms

There are a number of dairy products that are made from various components of milk. They are summarized in the following table. Dairy products can also be classified by the way they are processed. These classes are: Fluid milk products, cultured products, frozen desserts, and manufactured dairy products.

Fluid milk products include homogenzied milk, skim milk, creams, and chocolate drinks. Pasteurized, homogenized milk has already been discussed. Half and Half is at least 10.5% fat. Creams vary in fat content from 16-40% fat. Chocolate drinks are a combination of low fat milk, cocoa, sugar, stabilizers and possibly other ingredients.

Cultured products include such items as cultured buttermilk, sour cream, sour half and half, yogurt and a few other products. This requires the fermenting of certain milk products with bacteria. This is not done to any large commercial degree in the Virgin Islands, therefore most of these products are imported because we are not meeting the total fluid milk requirements in the Virgin Islands.

Frozen desserts produced in large quantities are ice cream, ice milk, soft serve products, sherbets and other novelty items. These products can be made from whole fluid milk or from dried milk products. The frozen dessert products are both imported and made locally.

Manufactured dairy products include cheese, butter, nonfat dry milk and dried whole milk. Other products in this class are evaporated milk, condensed milk, casein and a variety of modified products and blends. The difference between condensed and evaporated milk is that both products have less moisture than whole milk but condensed milk has an average of 44% sugar added for sweetness. The Virgin Islands produces almost no manufactured dairy products. However, we use dried whole milk and rehydrate it to make fluid milk for consumption to supplement our fresh milk supply.

Typical Composition percentages of selected dairy products (Adapted from Hugunin, A.G. & N.L. Ewing, 1977 Dairy-based ingredients for food products. Rosemont, IL. Dairy Research, Inc.

Ingredients	Moisture	Protein	Fat
Fluid whole milk	87.4	3.5	3.5
Fluid skim milk	90.5	3.6	0.1
Condensed milk[a]	27.1	8.1	8.1
Condensed skim milk[b]	28.4	10.0	0.3
Dried whole milk	2.0	26.4	27.5
Dried buttermilk	2.8	34.3	5.3
Light cream	73.0	2.9	19.3
Light whipping cream	62.9	2.5	30.5
Heavy whipping cream	57.3	2.2	36.8
Butter[c]	16.5	0.6	80.5
Cheddar cheese	37.0	22.0	32.0
Cottage cheese curd	79.0	16.9	0.4

[a] Plus 44.3% added sugar for sweetness

[b] Plus 42.0% added sugar for sweetness

[c] Plus salt

Agricultural Production on the Last Few Acres

By John A. Bernier, Jr.
Assistant Commissioner of Agriculture
St. Thomas/St. John

"And he gave it for his opinion, that whoever could make two ears of corn, or two blades of grass, to grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together."
Jonathan Swift (1667-1745)

By substituting improved techniques of production for outmoded traditional methods, and with some shift in land use, the U.S. Virgin Islands, particularly St. Thomas and St. John, could have a well-deversified and highly productive agricultural industry. The resulting increases in production would enable the islands to become much less dependent on imported food. Since only a relatively small area is available for farming purposes, the main hope for raising the level of agricultural output lies in obtaining higher yields from each acre. This requires widespread utilization of good management practices and a breaking away from some traditions which are non-productive and outmoded. It means the general use of improved varieties, greater and more effective use of fertilizers, application of sprays and dusts to control insects and diseases, and use of various other measures that effectively contribute to high level production.

Only a few farmers in the Virgin Islands now follow many of the production practices necessary for high yields that are recommended by the C.V.I. Cooperative Extension Service, which is a cooperating agency with the V.I. Department of Agriculture. The farmers who plant a crop but do little in addition to make it grow are in the majority. These farmers are planters, not growers. About all they do is put the seeds in the ground and leave the rest to the whims of Mother Nature.

They use little or no fertilizer, and rarely protect the growing plants from insect damage or diseases by spraying and dusting. When the harvest is ready, these farmers must accept whatever yield there is. Small, at best, is the reward of being a planter and not a grower. Presently at the Dorothea Station in St. Thomas, plantings of pineapple and plantain in our seed multiplication program are extremely prolific due to proper maintenance and the controlled use of pesticides and fertilizers.

What the U.S. Virgin Islands needs is for more of its farmers to be growers, good growers who will employ the improved methods and practices of crop production recommended by the extension service. Their offices on St. Croix and St. Thomas provide a vast amount of information on agricultural production techniques developed through many years of experimentation and research. With all of this readily available to farmers, we still find that most of them continue to follow their own traditional and outmoded production methods. Thus, if production from the limited amount of land or, as I prefer to say, the last few acres in the U.S. Virgin Islands, is to be increased, the wide gap that now exists between modern techniques and outmoded traditional practices will have to be bridged.

Extremely steep terrain on St. Thomas is now dotted with home sites.

More positive efforts on the part of the Department of Agriculture will have to be made to encourage farmers to adopt improved production methods and utilize improved varieties which result in higher and more profitable yields on our limited acreage. For the most part, the farmers who produce beef cattle, which is by far the major area of agricultural production in the Virgin Islands today, stand head and shoulders above all the other farmers in their use of advanced production practices.

With greater yields per acre, less land would be required for producing the vegetables and fruits that the farmer would be able to market. Large numbers of farmers could double or even triple their present yields and returns by employing the right combination of growing practices, which would include proper land preparation, use of improved varieties, use of adequate amounts of fertilizers, control of damage from insects

and diseases, and proper soil management to control moisture retention and keep down weeds.

Terracing system has been used extensively by St. Thomas farmers for decades.

Finally, there is a big need for more and better home gardens, and yet much of the land available to householders is not used for food production. Much of this land is in small plots, but no matter how little the patch may be, it still can be mae to produce some food. The Virgin Island Dept. of Agriculture encourages this use of the last few acres to the maximum.

Wanted: Aquaculturists!

By James Rakocy
Research Aquaculturist
C.V.I. Agricultural Experiment Station

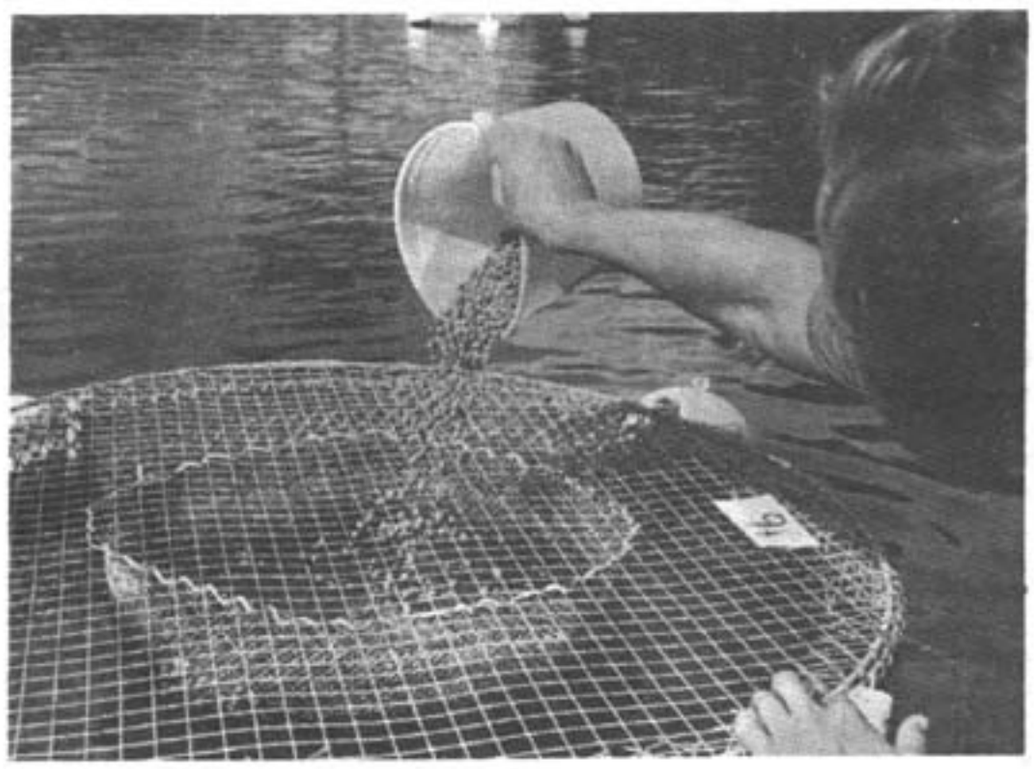
Aquaculture, the art of culturing aquatic organisms for food, began thousands of years ago in China. Today the art of aquaculture is becoming a science as aquaculturists from around the world look for efficient ways of growing aquatic animals and plants to help meet the increasing demand for food by the world's burgeoning population.

The culture of aquatic food, primarily fish, is an important supplement to the supply that comes from wild stocks. Global fishing statistics reveal that annual catches, which increased by about 7 percent per year from 1945 to 1970, have levelled off suddenly during the 1970s at about 70 million tons. One reason for this is that wild stocks have been poorly managed and several species are being depleted. In contrast, aquaculture production, which stood at 6 million tons in 1975, has expanded rapidly during the 1970s and experts estimate that annual production may reach 50 million tons by the year 2000.

There are shortages of fish in much of the world that could be alleviated through aquaculture. The United States and the Virgin Islands are good examples of areas that do not posess sufficient stocks of wild fish to meet local demand. The U.S. annually imports about 60% of its total consumption of fish and fish products. In 1977, these imports accounted for a $2 billion trade deficit, which was 28 percent of the total non-petroleum related trade deficit. The situation is similar in the Virgin Islands. In 1979, fish imports to the Virgin Islands amounted to 5.7 million pounds worth $6 million compared to local catches of about 1.3 million pounds. There is little hope of increasing local catches because this fishery is close to its maximum sustainable yield. The potential for reducing these deficits is in aquaculture. In some countries over 40% of the total fish supply is grown by fish farmers.

An alternative supply of fish is needed because nutrition-conscious Americans are eating more fish. In 1978, Americans consumed 13.4 pounds of fish per person, up from 12.8 pounds the year before and 11 pounds in 1964. Further increases in demand are projected because the superior nutritional qualities of fish are being recognized by more people. Fish is an all-purpose protein food. The flesh contains the 22 amino-acids commonly found in animal protein and an excellent balance of the eight essential to human health. The fat content of fish muscle averages less than 5%, a value that is lower than almost all other meats. Fish muscle contains little connective tissue, making it easy to digest, and has high levels of the essential minerals and water soluble vitamins.

Aquaculture may help increase the demand for fresh fish in the Virgin Islands, which has been hindered to an extent by the problem of ciguatera, a naturally occurring toxin in marine fish. The toxin becomes concentrated as it passes through the food chain of salt water fish and reaches harmful levels in a very small percentage of predatory fish from certain areas. Research is being conducted by the Biology Department of the College of the Virgin Islands to characterize the ciguatera toxin and devise a simple test to find out if a fish has the toxin before it is eaten. Being stricken by ciguatera is a serious matter and generally requires a trip to the doctor and several weeks of recuperation. There is no reliable way of determining whether a fish has the toxin at present and people are cautious about eating locally-caught fish. Many people have eliminated fresh fish from their diet altogether. Fish produced through aquaculture are being raised in freshwater and are free of any toxin. Knowledge that these fish are completely safe would certainly stimulate demand for fresh fish in the Virgin Islands.



Caged tilapia are fed fish pellets every day to insure a well-balanced nutritious diet which will lead to proper growth.

Other benefits to be derived from aquaculture would be an increase in employment opportunities and a greater degree of self-sufficiency in food production, which is particularly important in the Virgin Islands. During this period of economic recession, federal spending cutbacks and the ever-present threat of disruption of our oil supplies, high priority must be given to the encouragement of local food production.

The United States Senate and House of Representatives have recognized the importance of aquaculture development and have responded by the passage of the National Aquaculture Act, which was signed into law by President Carter on September 26, 1980. As national policy for aquaculture, the Act calls for

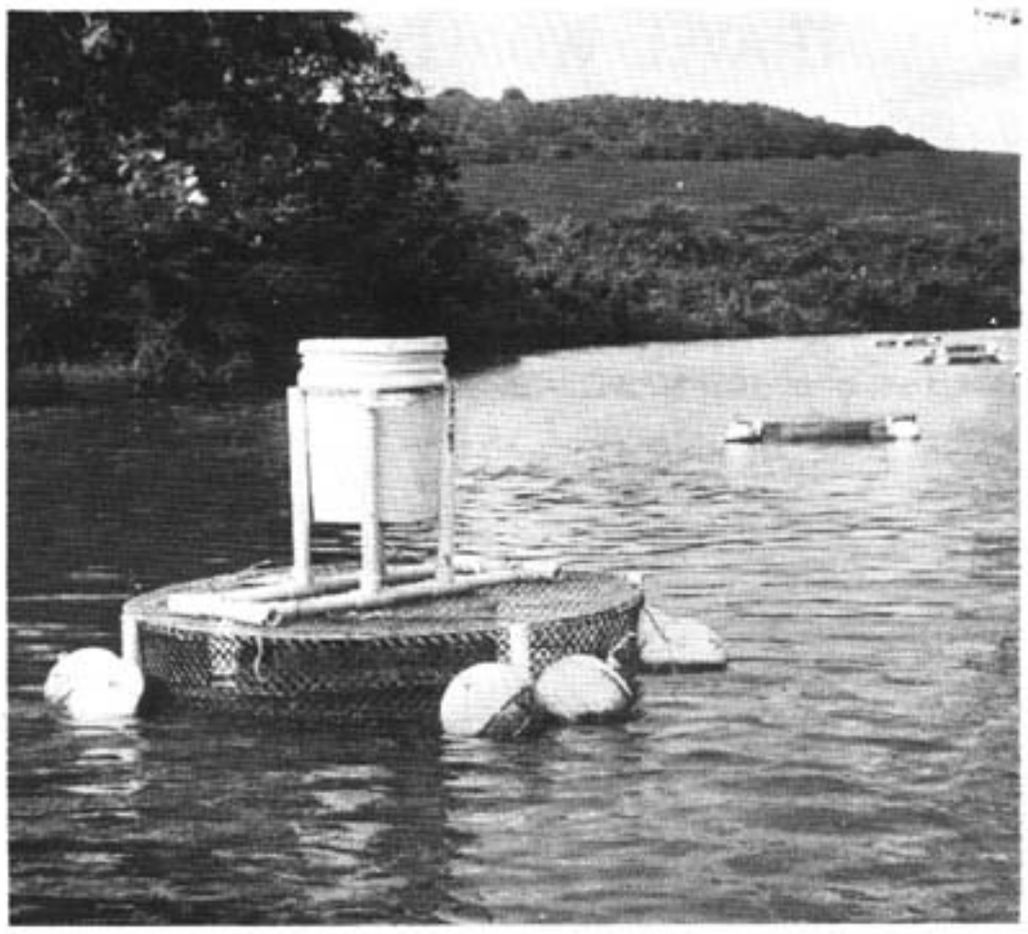
the establishment of a National Aquaculture Development Plan by April of 1982. The plan will identify aquatic species that have significant potential for culture on a commercial basis and recommend actions that are necessary to achieve increased yields. Programs for research and development, technical assistance, demonstration, extension education and training will be included. Aquaculture, as defined by this plan, is not restricted to food production but includes the production of industrail materials, pharmaceuticals and energy as well as the use of aquatic resource management as a means of control and abatement of water pollution. The National Aquaculture Act should encourage extensive aquaculture development, greater domestic production of aquatic food, decreased reliance on foreign imports, creation of new industries and job opportunities and other national benefits. Locally, a bill to explore the potential of aquaculture in the Virgin Islands is currently being considered by the V.I. Senate.

There are a number of programs already in effect that could be utilized to aid aquaculture development in the Virgin Islands. One of these is an aquaculture loan program sponsored by the Farmers Home Administration (FmHA) of the U.S. Department of Agriculture. FmHA has several types of loans available to prospective aquaculturists, but the two most important ones are farm ownership loans and operating loans. Farm ownership loans are made to eligible applicants to become the owners and operators of family farms. Ownership loans are used for the purchase of land, including water resources, for the development of a successful aquaculture operation. Operating loans are made to enable applicants to become operators of family farms. This loan is available to finance equipment, brood stock, fingerlings, feed, family living and farm operating expenses and minor land and water improvements. Operator loans are designed to improve the farmer's standard of living and help him establish a sound aquaculture system. Additional information about aquaculture loans can be obtained from FmHA offices in the Virgin Islands.

To obtain technical assistance for an aquaculture venture, a farm owner can call upon the Soil Conservation Service (SCS), an agency of the U.S. Department of Agriculture. SCS personnel will visit the farm, and inspect construction as it proceeds. Moreover, the SCS in the Virgin Islands has access to an aquaculture specialist with the Puerto Rico Department of Natural Resources, who will travel to the Virgin Islands and offer technical assistance to would-be-aquaculturists based on experience gained with aquaculture in Puerto Rico. The proposed National Aquacultural Plan calls for the establishment of an aquaculture training program for SCS field technicians and the readjustment of workloads to increase aquaculture technical assistance.

The Virgin Islands Department of Agriculture aids aquaculture development through its freshwater pond program, which has been in operation for many years. A 1975 inventory lists 225 ponds that were constructed or renovated on St. Croix since 1920. The purpose of this program has been to provide water storage for livestock and wildlife, irrigation, ground water recharge, flood prevention and fire protection, but many of these ponds could be used for fish culture. There is no charge for this service. In addition, the Department of Agriculture instituted a cost sharing program in 1981 to encourage freshwater fish farming and other types of agricultural production. A farmer who marketed more than $1,000 annually was eligible to receive 20 cents for each pound of fish he marketed. The continuation of this program in

1982 is dependent on the availability of funds.



Aquaculture program utilizes one of many St. Croix ponds. Suspended fish culture cages are seen in background; a new self-feeding device has been installed on cage in foreground.

Aquaculture is a diverse field consisting of hundreds of cultivated species and systems of cultivation. Before a viable aquaculture industry can be established in a new area, feasibility studies should be conducted for the species and systems showing the greatest potential for that area. Moreover, culture technology that has proved successful for a species elsewhere will have to be modified to fit a new environment and basic information and training will have to made available to farmers who do not have experience in aquaculture techniques. This work is being carried out by the Agricultural Experiment Station of the College of the Virgin Islands.

From the beginning of the aquaculture research program at the Experiment Station, tilapia was selected as the fish showing the greatest potential for culture in the Virgin Islands. The culture systems with the most promise were cage culture in freshwater ponds and intensive culture in tanks with adjoining filtration systems. Experiment Station aquaculturists have written a number of articles in previous Agriculture and Food Fair Bulletins providing general information about tilapia and these culture systems (Freshwater Aquaculture a Possibility for the Virgin Islands, 1978; A Prospectus for Cage Culture of Freshwater Fish in the U.S. Virgin Islands, 1979; Marketing Tilapia in the Virgin Islands, 1980; A New Approach to Backyard Fish and Tomato Production, 1980; Fish Culture and Hydroponics in the Virgin Islands, 1981.) Recently, the aquaculture research installation was expanded by the addition of 30 new cages, 34 pools, 6 recirculating systems and a field laboratory. The new facilities will greatly increase aquaculture research capabilities. Information generated through experiments will be used to develop detailed procedures for tilapia culture that are efficient, practical and profitable. Results of this research will be made available to the public through articles, fact sheets, bulletins, demonstrations, seminars and workshops.

As the world's annual catch of wild fish reaches its limit, aquaculture offers to increase this vital source of nutrition for many years to come. National and local governments stand ready to give an unprecedented level of support for aquaculture development. The challenge now rests with individuals who want the fulfilling, profitable and important career of growing aquatic food.

Forestry Today in the Virgin Islands

By Eric 'Larry' Bough
Director of Forestry
V.I. Department of Agriculture

The Forestry Division of the V.I. Department of Agriculture was officially started on July 1, 1967. Prior to this it was known as Road Side Tree Improvement. Later it became the V.I. Forestry Program, a title that was replaced with its present one in 1974.

Many residents are not aware as to the purpose of the Division of Forestry; the majority class us as "tree cutters", a title which carries some merit as most of our public contacts come in the form of tree felling. Nevertheless, our primary purpose is that of reforestation.

To accomplish the reforestation phase, the division operates a nursery where seedling of timber species, predominately hybrid mahogany, are produced on an average of 10 to 15 thousand annually and made available to landowners to establish woodlots and plantations. This is free of charge including the technical advice that accompanies the seedlings, due mostly to a reimbursable program sponsored by the U.S. Forest Service known as Rural Forestry Assistance. This program includes production, procurement and distribution of tree seeds and trees; development of genetically improved tree seeds and planting for reforestation and afforestation; and technical assistance to private forest landowners and managers, vendors, forest operators, wood processors, public agencies and individuals. Mahogany plantations and woodlots extend as far east as Estate Green Cay and west to Ham's Bay. Almost all of these were planted through our program, but there are a few natural stands.

In addition to this program, we also have the Urban Forestry Assistance Program whose primary is to improve activities to benefit the lives and environment of urban residents and public agencies of the Virgin Islands through the use and appreciation of trees. To accomplish this purpose some objectives had to be established, the

The oldest tree plantation in the Virgin Islands is located at Davis Bay. These Honduras mahoganies were planted in 1908 by the Danish government.

most important being the following:

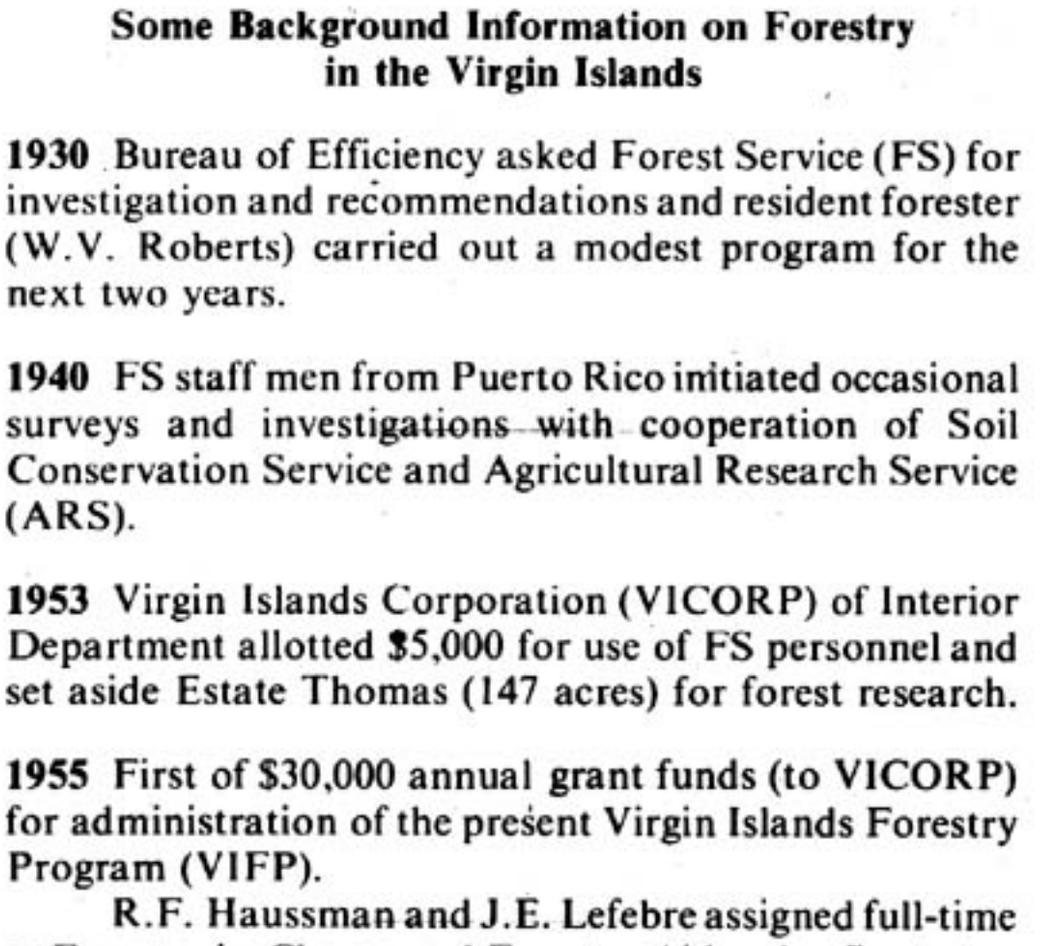
A. Develop island-wide urban and forestry plans for all three Virgin Islands including inventory of existing roadside urban trees, parks, green spaces and particular community needs.

B. Plan the maintenance of existing trees, development of tree planting and removal guidelines, development of technical training programs for responsible agencies, individuals and civic groups in tree planting, care, maintenance and removal.

C. Develop an information and education program for the general public on the benefits of trees, including planting of trees and care for existing trees.

In order to effectively operate any forestry program, there are two very important controls that must be stressed: fire prevention and control, and insect and disease control. Unlike the forestry operations in most of the United States, our fire protection is administered through our local fire department under a federally co-sponsored program known as Rural Fire Prevention Control. Our insect and disease control program gets assistance from the U.S. Forest Service in the form of research personnel, if, and whenever needed. Besides insect and disease, we do conduct various other types of research, such as adaptability studies and growth rate studies. These research areas are scattered over the island of St. Croix on estates such as Thomas Experimental Forest, Kingshill, Betsy's Jewel, Jealousy, Annaly Bay, Bodkin, and Ham's Bluff.

To a forester engaged in commercial forestry on the United States mainland (the production of lumber, pulpwood and related by-products) the idea of a forestry program in the Virgin Islands at first sight would seem unrealistic. Land values alone would seem to prohibit such a program. But the forestry operation in the Virgin Islands is much more than the reforestation of our bushy hillsides. It is a project which utilizes and develops our natural resource, the land, in a manner that compliments our tourist industry and enhances our environment. Forestry is an agricultural enterprise that requires a minimum input of scarce labor to produce an end product such as furniture, craftwood items, and fence posts. The expansion of the forest tree planting program into a tropical fruit tree program would be a further logical step.



Fencepost treating plant is in operation today at Estate Lower Love, St. Croix.

Forester Axel L. Frederiksen measures girth of Pacific Mahogany at Estate Thomas, St. Croix in 1968.

Some Background Information on Forestry in the Virgin Islands

1930 Bureau of Efficiency asked Forest Service (FS) for investigation and recommendations and resident forester (W.V. Roberts) carried out a modest program for the next two years.

1940 FS staff men from Puerto Rico initiated occasional surveys and investigations with cooperation of Soil Conservation Service and Agricultural Research Service (ARS).

1953 Virgin Islands Corporation (VICORP) of Interior Department allotted $5,000 for use of FS personnel and set aside Estate Thomas (147 acres) for forest research.

1955 First of $30,000 annual grant funds (to VICORP) for administration of the present Virgin Islands Forestry Program (VIFP).

R.F. Haussman and J.E. Lefebre assigned full-time as Forester-in-Charge and Forestry Aide, plus five to ten

crewmen.

1957 R.W. Nobles replaced Haussman.

1959 J.E. Munoz assigned as Forestry Aide.

1963 'FS purchased Estate Thomas from VICORP and established the Estate Thomas Experimental Forest.

1965 Program financing transferred to FS from VICORP.

1966 Axel L. Frederiksen transferred from horticulture in ARS to Forest Service to replace Nobles who transferred to Puerto Rico.

1967 CFM and CM-4 Agreements completed with the Government of the Virgin Islands (GVI). Commissioner of Agriculture (Hodge) was designated Territorial Forester, and responsibility for forestry programs was assigned to his assistant (Shulterbrandt).

Eric "Larry" Bough appointed horticulturist by GVI as GVI became full partner of FS in sponsoring the VI Forestry Program.

1973 Juan Nunoz replaced Nobles who transferred to Atlanta.

1974 Bough became director of the Division of Forestry and coordinator of US Forest Service activities in the Virgin Islands.

1976 A.L. Frederiksen retired from U.S. Forest Service.

Maintenance responsibilities for U.S. Forest Service program transferred to V.I. Forestry Program under V.I. Department of Agriculture.

Present U.S. Forest Service contributes funding and assistance through Atlanta and Puerto Rico to V.I. Forestry Program.

Tree planting along the Glynn Road took place in 1978 as part of the Urban Forestry Program. Shown are director of forestry Larry Bough (left) and Tom Steele.

Some Interesting Tropical Vegetables

By A.A. Navarro, Vegetable Specialist
C.V.I. Agriculture Experiment Station and
O. Henry, C.V.I. Cooperative Extension Service

There are a number of tasty tropical vegetables that gardeners in the Virgin Islands could be growing to augment their dinner table menus. Many of these crops hold an important place in the diets of people in tropical regions around the world. They are as delicious and nourishing as those vegetables that we commonly use here in our area. These crops, being inherently tropical, are well adapted to the rigors of a tropical environment. Most of these crops are highly resistant to the destructive pests and diseases so numerous in the tropics. These crops are also so easy to grow that even with very little care they manage to produce considerable yields. Some of these plants, aside from being sources of delicious and nourishing vegetables, also provide other very important uses.

LOOFAH (LUFFA)

Of these less known, important and interesting vegetables of the tropics, the one at the top of our list is the loofah gourd also known as Chinese okra, Chinese loofah, vegetable sponge or dishcloth gourd. The loofah belongs to the squash family. Like all the species under this family, loofah has a viney growth habit. The gourds are produced by two species, **Luffa acutangularis (ridged gourd)** and **Luffa cylindrica (smooth gourd).**

Picked young or before the fibers toughen up, loofah gourds can be made into various culinary delights. They are excellent in salads, stews, and soups, and for making into delicious stuffed luffah and other delectable recipes (See recipe section)

The leaves and the flowers of the loofah plant are used also as vegetables. In Malaya, the young leaves are popular vegetables. In China, the flowers are prepared into appetizing recipes. Left to mature on the vines the fibers toughen up and the loofah gourds become a source of excellent bath sponges or perfect pot scrubbers, particularly for non-stick pans. Loofah sponges are also made into pot holders, doormats, gloves, sandals and for stuffing mattresses and cushions. The method of growing loofah is to start from seeds, and as soon as the plant starts growing it is trained to climb a support or trellis. Some gardeners let the plant run on the ground, but for increased production of high quality fruits and convenience in harvesting, it is better to grow loofah with some kind of support. Usually three months after planting the first green fruits can be harvested and used as a vegetable. For sponge production, the loofah is left to dry on the vines until the color of the fruits has changed from green to tan or brown.

Edible luffa ready for harvesting is displayed by CVI experiment station assistant Bob Yearwood. When allowed to age further, luffa makes a good bath sponge.

Loofah production can be a profitable enterprise in the Virgin Islands. There is a good market for loofah sponge in the continental United States and in other countries. The tropical climate of the Virgin Islands is well-suited for loofah production. Trial plantings of loofah at the Agricultural Experiment Station have shown that loofah performs very well under our soil and climate conditions.

HORSERADISH

The horseradish tree **(Moringa oleifera)** also known as malunggay and as moringa is another very useful plant of the tropics. Almost all parts of the plant can be used as cooked human food. The leaves and the pods or fruits are the parts most popularly used as vegetables. The young pods when cooked taste like asparagus. Among the green leafy vegetables, the leaves of the horseradish tree are exceptionally rich in sulfur-containing amino acids. The soft roots of the tree are a good substitute for the true horseradish.

This plant is a perennial, growing into a small tree of up to about 25 feet. Being a perennial, the tree can provide a

Some tropical vegetables easily available in the Virgin Islands are (clockwise top left) bush okra, horseradish (moringa) pods, horseradish leaves, and flowers of squash.

supply of nourishing and delicious vegetables throughout the year. The plant is very easy to grow and needs only minimum care. It is highly resistant to pests and diseases. Termites are the only pests that have been observed to bother the plant. The plant can be propagated either by seeds or by stem cuttings. Planted along property borders or fence lines, the trees serve as excellent windbreakers and live fence posts.

PAK-CHOI

An excellent substitute for cabbage in the tropics is a leafy vegetable popularly known as Pak-Choi, also called Pechay or Petsai. It belongs to the same family as the cabbage. Among botanists, Pak-Choi is known as **Brassica rapa** var pekinensis.

Cabbage is a high-risk crop in the tropics since it attracts many destructive insects. Pak-Choi, on the other hand, is seldom bothered by insects or diseases and is also heat and drought resistant. It is a perfect crop for the Virgin Islands.

Pak-Choi is a short-season crop. Usually ready for harvest 6-8 weeks after planting, it is a heavy-yielding crop which produces a rosette of green leaves with white succulent stalks. Except for the roots, all parts of the plant are edible and can be served as delicious vegetables.

Blanched or raw, Pak-Choi can be mixed with other vegetables to make satisfying salads. Sauteed either by itself or with other vegetables, Pak-Choi is turned into a delicious dish and is also excellent for making soups and various kinds of stews. (See recipe section)

Pak-Choi is a perfect crop for the Virgin Islands as it is resistant to heat, drought, insects and diseases.

BODIE BEANS

For gardeners in the tropics who have a special fondness for beans, it should be welcome information to know that there are a number of bean species well-adapted to the tropics. One of the most important is what is popularly known as Bodie beans **(Vigna sesquedalis).** They are an excellent substitute for the French snap beans, the only kind of green beans most of us are accustomed to, but French beans are quite difficult to grow. Most available commercial varieties of French beans **(Phaseolus vulgaris)** are sensitive to high temperatures prevailing during most part of the year in our area. Bodie beans on the other hand, are beans of the tropics. They can be grown successfully in our islands any time of the year, are heat-tolerant and better able to withstand long periods of drought. They are heavy yielders, producing pods 10-12 inches long. Picked at the right stage of maturity, Bodie beans will substitute for any uses of snap beans.

Pole Bodie beans are a delicious substitute for northern French stringbeans and grow to a yard in length!

Bodie beans either are of the bush type or have a climbing growth habit. The bush type is an improved variety developed by researchers at the University of the Philippines. Many gardeners prefer the bush type because it does not need to be staked or supported, an operation expensive in both time and materials. However, some gardeners prefer to grow the pole types for their unusually long pods which in some varieties measure more than a yard in length.

The young leaves and vines at the tip of the Bodie bean plant known as bean tips are a popular vegetable in many places in the Pacific. Bean tips can be prepared for the table in many different ways. (See recipe section).

MALABAR SPINACH

The true spinach **(Spinaeia oleracea)** is not a crop of the tropics. This vegetable only grows well in areas with cooler temperatures, but vegetable gardeners in the tropics will not miss the true spinach very much because there are a number of excellent substitutes. One of these is what is commonly known as malabar, ceylon, or up-the-island spinach. Scientifically, it is known as **Basella alba.**

Malabar spinach is a perennial climbing vine. If it is well-cared for, the plant can be maintained almost indefinitely; otherwise it would start dying after two years. The upper portion of the stems and the leaves can be utilized as substitutes for all the uses of the true spinach. Not only does Malabar spinach substitute for the true spinach but it is also a good substitute for lettuce in making salads. The plant bears fleshly fruits that are purplish black in color. The juice of the fruit can be used as a dye.

Malabar spinach can be propagated either by seeds or stem cuttings which root very readily. A month after planting, the first harvest can be made. The plant is adapted to a variety of soils and has been observed to be almost totally free of diseases and insect pests.

BUSH OKRA

Bush okra is one of a number of plants whose food value and culinary properties are unknown to many people in the islands. Here in St. Croix, bush okra grows wild all over cultivated and uncultivated fields and road sides. It is treated as an ordinary troublesome weed. In

Africa, India, and many other places in the Pacific the edible qualities of the bush okra **(Corchorus olitorius),** also known as Jute mallow or saluyot, are widely known. Some even believe that bush okra has invigorating or tonic properties.

The parts used as vegetables are the shoot tips and the leaves. The protein content, particularly of the older leaves, is desirably high. They are always eaten cooked. The leaves and the shoot tips need only little cooking for they soften rapidly. They are excellent substitutes for almost all the uses of okra. They can be used to make appetizing vegetable stews and soups.

Bush okra is an easy plant to grow. It is adapted to a wide variety of soils and is very drought tolerant, a characteristic so suitable for cultivation in the islands. The plants are only grown from seeds. Four weeks after planting, one can start picking the leaves and tips to be cooked into a delicious dish.

The importance of bush okra does not only lie in being a source of delicious vegetable. Bush okra is grown on a commercial scale in many tropical regions around the world for its fibers, and among other things, provides the world with what is popularly knows as Jute fibers which are used for making ropes, twines, and bags.

SOME SUGGESTED RECIPES

Stuffed Pak-Choi

Wash Pak-Choi leaves and remove hard stem and spoiled parts. Use only tender green leaves and soft stems. Save large, whole Pak-Choi leaves or use cabbage leaves for rolling.

Start by blanching large Pak-Choi or cabbage leaves until flexible enough for rolling. Remove from pot and lay flat on clean counter or foil.

Next, assemble:

½ cup chopped onion
½ cup chopped red sweet pepper
1 tsp. cooking oil
1 tbsp. margarine
3½ cups shredded Pak-Choi
1 tsp. parslied salt
¼ cup grated cheddar cheese
¼ cup American cheese
½ cup mozarella cheese
3 tbsp. cream mushroom soup (canned or freshly made)
3 tbsp. cooked rice

Saute: Chopped onion and sweet pepper in cooking oil and margarine until tender but not brown.

Add : 3½ cup shredded Pak-Choi, saute until limp.

Add : ½ tsp. parslied salt. Remove from fire and cool slightly.

Add : Cheese and rice. Toss together until evenly mixed. Cool completely.

Place one heaping tablespoon of mixture on each blanched leave (cabbage or Pak-Choi). Roll over top edge of leaf, tuck in sides and continue rolling over top edge. Secure last fold with tooth pick. Continue process until mixture is used up. Set rolls in glass casserole dish. Combine ½ cup cream of mushroom soup with ½ cup of water. Pour over rolls in dish and cover with foil or

casserole cover and cook in oven 400° F for one hour. When finished, rolls should be partly covered with juice to be served with rolls.

Bodie Beans with Pork and Guava Juice*

1 cup water
1 cup fresh pork without skin, cut in cubes
2 cloves garlic, crushed
¼ cup chopped onion
2-3 tbsp. soy sauce
½ cup snap Bodie beans
2-3 cups (firmly packed) Bodie beans tender tips and young leaves
8-10 medium guavas

In medium size pot, cook cubed pork in ½ cup water until all the liquid evaporates and brown slightly. Add crushed garlic and cook until brown. Remove and discard garlic. Add chopped onion. Cook until tender but not brown. Add snap beans and whole guavas. Cover and cook gently for about 5-8 minutes or until guavas are slightly tender. Remove guavas. Add tips and leaves. Cover and continue cooking. Crush guavas with spoon or potato masher. Add ½ cup water, agitating slightly to extract flavor. Strain juice from pulp. Discard pulp. Add guava juice and soy sauce to beans and tips, cover and continue to cook until done. Serve with white rice.

* *If guava is not available Beans and tips can be prepared according to recipe, omitting guava juice.*

LOOFAH

2 cups diced tender squash or loofah (peel if old)
1 tbsp. onion (minced)
1 tbsp. olive oil
1 tbsp. parsley
1 tsp. garlic (minced)
⅛ tsp. black pepper
⅛ tsp. salt
Dash soy sauce

Wash and slice squash (loofah) into thin slices, measure 2 cups and set aside. In a medium size skillet combine the other 6 ingredients and saute on medium heat 5 minutes. Add squash, (or loofah), stir into ingredients and cook until tender, about 10-12 minutes. Soy Sauce adds a zesty flavor to this vegetable, and all other vegetables.

Bodie Beans with Onions

4 cups snapped bodie beans
1 large onion
1 tsp. cooking oil
1 tbsp. margarine
1 tbsp. soy sauce
½ cup water
1 tsp. parslied garlic salt
Dash sugar
Dash parmesan cheese

Saute: Chopped onion in cooking oil and margarine until tender but not brown.
Add : Snapped beans and saute a minute or two longer.
Add : ½ cup water and parslied garlic salt, cover and steam another two or three minutes.
Add : Balance of ingredients. Cover lightly and steam to desired degree of doneness. If water cooks out before beans are done, add a little more to complete process. Very little water should be left after beans are done.

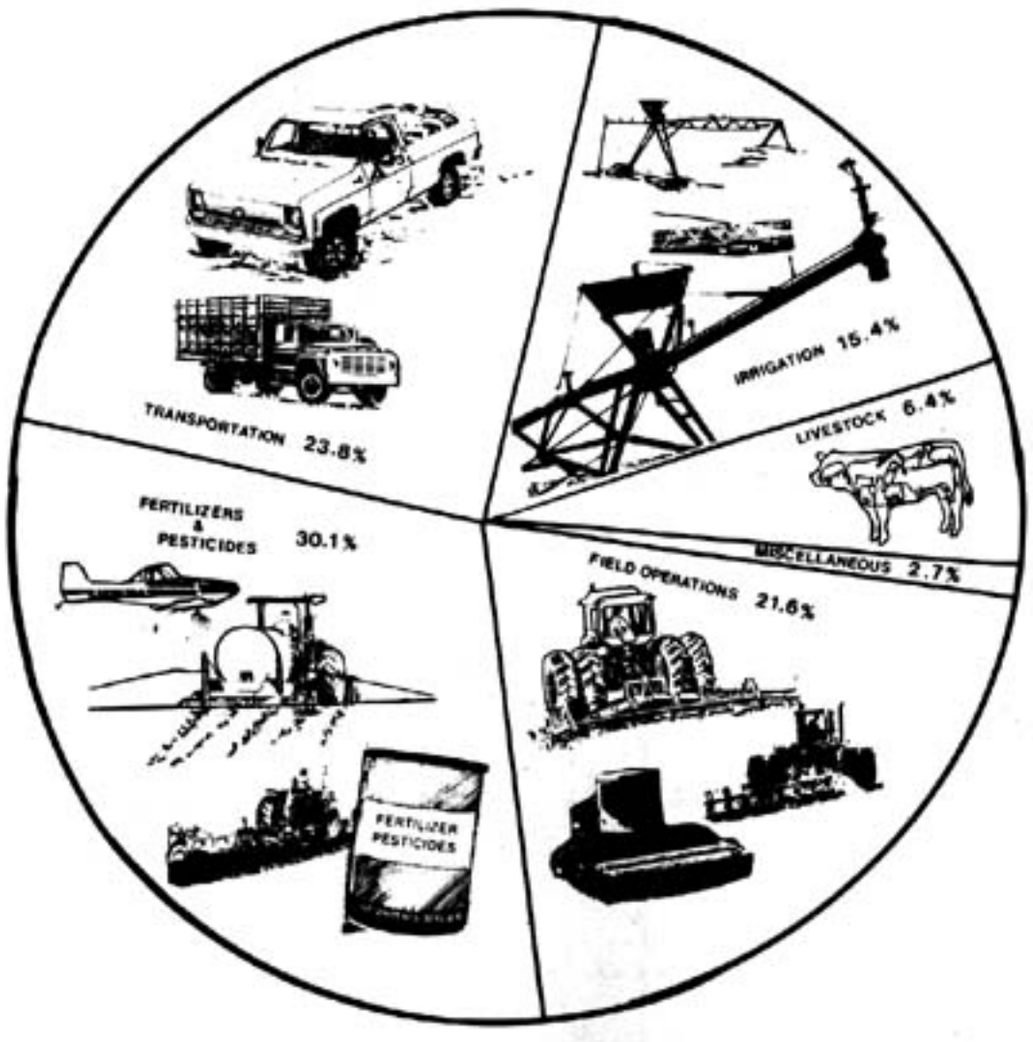
Saving Energy in Agriculture

By Frank R. Prince
Director, V.I. Energy Office

The U.S. Virgin Islands, like the rest of the United States, has experienced hardships as a result of oil shortages and energy prices. Scientists estimate that unless Americans become more conscientious about conserving natural resources we may find ourselves without domestic oil within 25 years and without natural gas even sooner.

The energy problems of the Territory could become more severe in the near future. Currently, residents pay 2-3 times the national average for electricity and import nearly 100 percent of our energy supplies since we have no energy resources such as oil, coal, natural gas, or uranium. Meanwhile, the average level of income here is 65% of the mainland average, yet the cost of living is approximately 30% higher. People in the Virgin Islands can't afford the luxury of ignoring a problem which is cutting into their actual incomes and standard of living so drastically.

Where Does The Energy Go?



(Information provided by the U.S. Department of Agriculture refers to survey done on U.S. mainland)

No one in the Virgin Islands should be exempt from learning energy conservation techniques. Although, local energy problems won't disappear overnight, with persistence and patience energy self-sufficiency could be achieved. The V.I. Energy Office has been educating the public for the past two years in regards to energy conservation measures for both industry and the small energy consumers.

During the past several months the Energy Office began addressing energy conservation methods for farmers. VIEO's Energy Extension Service, (VIEO-EES), in cooperation with the Department of Agriculture, has already sponsored two seminars on St. Croix and St. Thomas, dealing with energy conservation and self-sufficiency for farmers. Good attendance at these meetings and the interested response from participants has prroved the timeliness of the subject matter. VIEO-EES has additional seminars and a wind irrigation demonstration project scheduled for 1982.

There are several possible ways to reduce dependence here on electricity produced by fossil fuels. Alternate or renewable energy sources such as solar and wind power could significantly reduce our dependence on foreign oil. Climate conditions in the Virgin Islands offer special opportunities for the highly effective use of alternate energy technologies: low cloud cover, almost daily sunshine, intense sun rays, natural lighting, and persistent tradewinds. Alternate energy measures which could be explored in the Virgin Islands include gasohol, methane from wastes and the possible significance of biomass (including sugar cane.) Energy management systems need to be developed for local farms to lessen the operational costs which make farming so expensive.

VIEO-EES is presently implementing several agriculture projects for the benefit of the community:

a) **Anemometer Loan Program** - The Energy Office is loaning out two wind measurement devices, one on St. Thomas/St. John, and on St. Croix, to people who are interested in finding out whether a particular site has potential for wind energy use. This program is proving to be very popular and the anemometers are in constant use. Individuals who borrow an instrument are being given literature to guide them in their investigations. In return, they are asked to provide VIEO with copies of the data they collect.

b) **Farmer's Program** - This EES Program is aimed at alleviating the high operational costs of farm machinery in the V.I. Clinics are being planned for interested farmers, teaching them to develop practical maintenance schedules as well as how to save money through optimum fuel efficiency techniques.

c) **Wind Energy Irrigation Test Site** - In cooperation with the V.I. Department of Agriculture, the VIEO-EES Program is setting up a wind energy irrigation

demonstration program. Farmers will be able to see for themselves how the wind can replace expensive wind driven electric pumps. Also, EES personnel will have an information package available soon that includes details about zoning laws, prices, financing, and other issues that a farmer should study before deciding whether he can use wind energy irrigation to benefit his business.

Our energy future is, to a great extent, in our hands, and we must act now. In addition to all the available programs, we need farmer input, planning and intensity of desire. Although farming the territory can be difficult, there are ways to make it a successful venture. The EES staff will be making onsite farm visits during 1982 to make recommendations on energy saving techniques to interested residents.

Anyone interested in finding out more about the EES projects is welcome to call the VIEO Hotline Information number at 772-0063 or visit the Energy Library either at its St. Croix location (47A Mars Hill, Frederiksted) or the St. Thomas location (40 Subbase, Charlotte Amalie.) Copies of the Follow-Up Reports from the three EES Agriculture Seminars already held are available upon request.

The Use of Tropical Fruit Trees in the Home Landscape

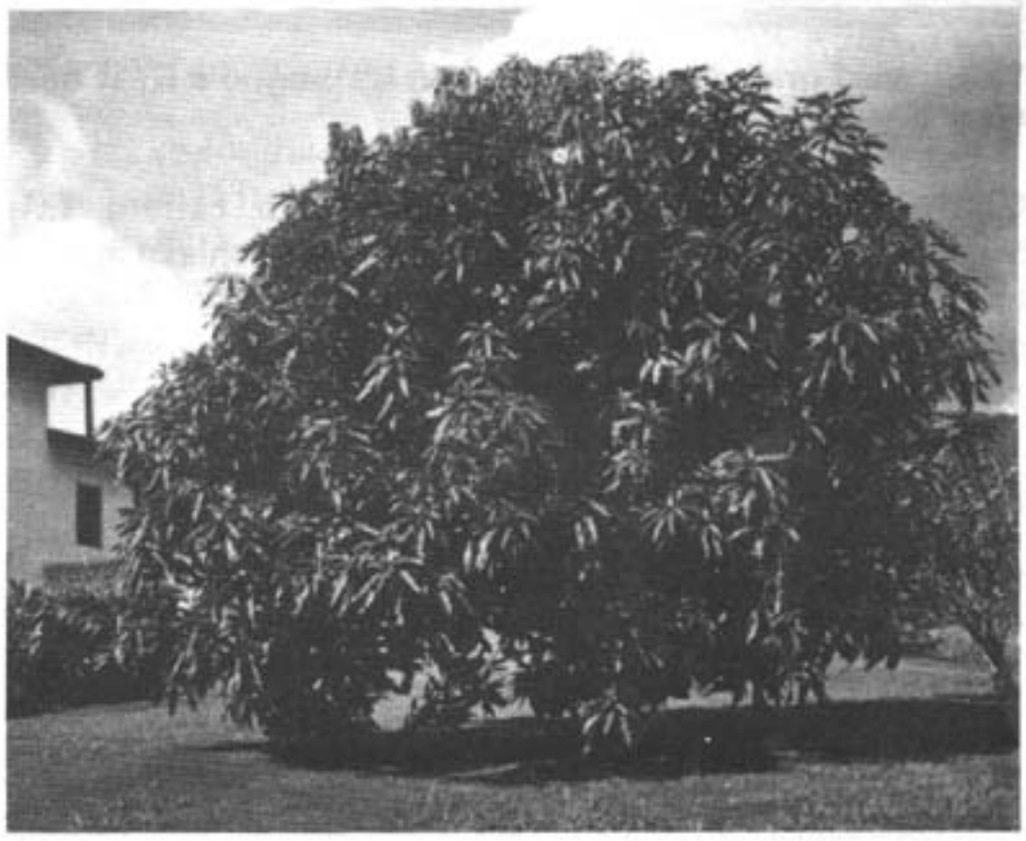
By Clinton George
Horticulturist, Cooperative Extension Service

A well landscaped home is a credit to the owner and his family, his neighbors and to the community as well. Virgin Islanders, like everyone else, enjoy seeing their home with striking shade trees, well pruned shrubs, and delightful flowers. One can attest to this by simply driving throughout the islands and observing some of the most beautiful landscape imaginable.

Today, with the increasing cost of land and the inflationary effect on food prices in the Virgin Islands, home owners must utilize landscape wisely. One way in which Virgin Islanders can benefit is by including dual-purpose plantings in their home plan - trees that may be used both as ornamentals and for fruit production.

The aesthetic value of trees and shrubs that produce edible fruits has long been recognized. Coconut and seagrape, in particular, are often used in some areas strictly as ornamentals. These fruit trees, as well as numerous others, could make a valuable contribution to the diet and nutritional well-being of the home owner. Imagine the enjoyment of seeing the beauty of the trees and their fruit, the joy of harvest, and the pleasure of eating tasty fresh fruits or using them in various home recipes.

The list of fruit trees selected below represents a partial list and could be augmented according to the likes and taste of the individual. For each species, specific information including growth habit, ultimate espected dimensions and preferred method of propagation are discussed. The use of vegetatively propagated plants, (by cutting, air layering, grafting, etc.) is advantagious because seedlings often times vary greatly in fruit quality and growth habit. The ultimate tree and fruit size will vary depending upon cultivars, location, soil type, management practices, pest control and other environmental factors. For information on cultural operations and available plant sources please contact C.V.I. Cooperative Extension Service on St. Croix, St. Thomas or St. John.



Medium sized grafted mango is planted at a distance from house so that fruit does not fall on roof.

Dwarf Malayan coconut sets off the attractiveness of this house and provides fruit which is easily accessible.

The following are some fruits that can be included in the Virgin Islands home landscape plantings:

AVOCADO **(Persea americana Miller)** Tree useful for shade and for "framing" a structure, canopy ranges from low, dense and symmetrical ("Fairchild", "Waldin") to upright and asymmetrical ("Lula"). Limbs easily broken by strong winds and heavy crops. Tree demands perfect drainage. Compact cultivars can attain a height and spread of 16 ft x 25 ft. Method of propagation is grafting.

BANANA **(Musa spp.)** Fast growing herbaceous plant of palm-like habit, useful for imparting a "tropical" aspect to planting. Bananas need a constant supply of water and a rich soil to do well. Many cultivars are grown in the Virgin Islands including "Cavendish" (dwarf & giant), Horse banana and bacuba (silk fig). The Dwarf Cavendish reaches a height and spread of approximately 8 ft. for the individual plant; a clump may be 13 ft. or

more in spread. The Giant Cavendish and Horse banana grow to a height of about 9-12 ft. with a spread of about 10 ft. The Horse banana has the added advantage of its tolerance to drought and requiring less attention. Method of propagation is by division.

This dwarf grafted Julie mango in Catherine's Rest has an attractive bushy appearance.

CAIMITO; Star Apple **(Chrysophyllum cainito L.)** Strikingly handsome, ornamental tree which reaches a height of 45 ft. given favorable conditions. Vegetatively propagated plants are somewhat smaller. Growth is graceful, and no pruning appears to be necessary. Leaves are oval, shiny dark green above and coppery gold, silky and heavily hairy beneath. There are two types of caimito, distinguished by the color of the ripe fruit. The purple fruit has slightly more flavor, and the green is sweeter. Methods of propagation are grafting, cutting and layering.

CARAMBOLA **(Averrhoa carambola L.)** Small, slow growing evergreen, with round symmetrical canopy. Light to dark green compound foliage and yellow or cream-colored fruit with five prominent longitudinal ribs, star shaped in cross section. Fruit matures throughout the year. Some cultivars need cross pollination to fruit well. "Golden Star" fruits well in isolation. Preferred propagation methods are grafting and air layering. Dwarf cultivars are expected to reach a height and spread of about 13 ft., tall cultivars 26 ft.

CHERRY, West Indian; Acerola **(Malpighia glabra L.)** Large branched shrub or a small tree if pruned to form a central trunk. It varies in shape from a low spreading habit to a more upright and open habit. Useful for hedges with a moderate degree of pruning or as single, standing specimens. Leaves tend to maintain a healthy dark green, even on calcareous soils. The small, attractive flowers range in color from pale pink to rose. The bright, waxy red fruit is also attractive and has an incredibly high amount of vitamin 'C'. Preferred methods of propagation are air layers and cuttings. Ultimate dimensions are approximately 16 ft. by 13 ft.

CITRUS Species; Many citrus fruit trees are of considerable ornamental value. However, the grapefruit and limes are much more adapted to Virgin Islands conditions.

GRAPEFRUITS **(Citrus paridisi Macf.)** One of the largest citrus trees in deep soils often time reaching a height and spread of about 45 x 35 ft. Two groups are known: The white ('Duncan', 'Marsh') and the pigmented ('Thompson', 'Ruby Red') cultivars. Preferred method of propagation is budding.

LIME, Tahiti **(C. latifolia Tanaka)** Tree is small, to 20 ft. in height and 23 ft. in spread, with round canopy hanging close to the ground. Easily pruned to shape. Methods of propagation are air layering, budding, and cuttings.

LIME, West Indian **(C. Aurantifolia Swingle)** Highly prized for home plantings because of its brisk-flavored fruit. This tree is of somewhat disorderly growth unless shaped by pruning. Methods of propagation are seed, air layering, and budding. Attains a height and spread of about 20 ft.

COCONUT **(Cocos nucifera L.)** This tree has long been recognized for its fruit and ornamental value. Young palms contribute to the landscape picture from a young age if adequate attention is paid to fertilizing and watering especially during dry periods. The 'Malayan Dward' is actually a semi-dwarf which grows more slowly

than other cultivars and reaches a height and spread of about 40 ft. and 20 ft. respectively. There are three 'Malayan' Dwarf forms - green, yellow and golden, recognized by the bright color of the petiole and the fruit. These palms can be successfully grown on a wide range of soil types providing they are well-drained. Propagation is entirely from seed.

GUAVA, Common **(Psidium guajava L.)** This drought resistant tree, with training, makes a small shade tree of attractive proportions. The smooth, reddish - brown bark peels off in large flakes to reveal a smooth, gray inner bark. The fruit is an excellent source of Vitamin 'C' that can be eaten fresh or made into preserves, jelly or jam. Methods of propagation are air layering, grafting and cuttings. The tree reaches a height and spread of about 25 x 30 ft.

GUAVA, Strawberry or Cattley **(Psidium cattleianum Sab.)** Superbly attractive shrub or small tree with glossy green leaves and distinctive peeling bark in various shades of brown. Two cultivars of this species bear light yellow and red fruit, respectively. Plants may attain a height and spread of about 16 ft. x 13 ft., and are best left natural in screen plants or planted singly as mini-trees, in which case they may be judiciously pruned to shape them. Method of propagation is seeds which come true to type.

MANGO **(Mangifera indica L.)** This popular fruit makes a desirable ornamental and deserves a place in every home yard. Several heavy producing cultivars have been brought into the Virgin Islands including the smaller compact ones such as 'Julie' and larger ones such as 'Tommy Atkins'. Preferred method of propagation is grafting. Compact cultivars may attain a height and spread of 20 x 25 ft., and larger ones easily reach 30 x 35 ft.

Mesple (sapodilla) can attain a height of 36 feet and should not be planted too near the house. The dense canopy when full grown provides refreshing shade.

MESPLE; Sapodilla **(Manilkara zapota (L) Royen)** One of the most handsome of all broad leaved evergreen trees grown in the Virgin Islands. The mesple tree is slow growing with dark green leaves and a dense spreading canopy. It withstands drought well and makes few cultural demands. Large fruited cultivars such as 'Prolific' and 'Russell' are good for home plantings. Method of propagation is grafting. Tree readily attains a height and spread of 36 by 30 ft., and older ones may become much larger.

NATAL PLUM: Carissa **(Carissa Macrocarpa A. DC.)** This plant is used extensively as an ornamental shrub for foundation, specimen, and hedge planting. When planted as a hedge it forms an almost impenetrable barrier. Shrubby and dense in habit of growth, the plant does not develop a tree shape, even though a height of 15 ft. may be attained. The white fragrant flowers are in evidence several months of the year. The dark red fruits are eaten fresh, in salads, and as a sauce. Both the flower and fruit make a refreshing contrast with its glossy green leaves. Cultivars such as 'Fancy' grows moderately upright, while 'Alles' is low and spreading. Propagation methods are seeds, air layering and cuttings.

PLUM **(Spondias purpurea L.)** A small tree seldom exceeding 25 ft. in height usually spreading in habit, with smooth bark and rather graceful foliage. Two distinct cultivars of this species bear yellow and red fruit, respectively. The yellow plum is more commonly planted and is a larger tree with larger leaflets. Preferred method of propagation is cuttings. Large woody branches may be set directly in a desired location to grow.

The adaptable seagrape can serve as a handsome border or hedge.

SEAGRAPE **(Cocoloba uvifera L.)** This distinctive and attractive tree is most popular for seashore plantings due to its high degree of salt tolerance. It varies from a low shrub along coastal areas to a spreading tree up to 35 ft. high in more favorable growing conditions. The large, rounded leaves are closely spaced along the branches. Fruit is produced only on female trees but a male tree must be present for pollination. The fruit is utilized to make jelly or eaten fresh. Methods of propagation are seeds and cuttings.

Chemical Fertilizers are Expensive - Use Them Efficiently

By Christopher Ramcharan
Associate Horticulturist
C.V.I. Agricultural Experiment Station

Cost of chemical fertilizers forms a major part of the cost of production for the average farmer. However, because of poor cultural and storage practices and lack of knowledge of some of the basics about (chemical) fertilizers, the farmer often greatly reduces the effectiveness of the fertilizer he uses and does not receive the full value for the money he invests.

The amount of fertilizer applied, timing and placement can all affect fertilizer efficiency. In areas such as the Virgin Islands, soil factors have a great influence on fertilizer practices Soil texture, organic matter, pH, moisture, salinity and nutrient content influence the type, amounts and efficiency of the chemical fertilizers used. Plant factors affecting fertilizer efficiency include the crop type, rooting system, disease and insect damage, plant population, weeds and tissue composition. Under the hot, humid tropical conditions that exist locally, improper storage conditions most often account for the greatest losses of fertilizers.

APPLICATION

In applying fertilizer, important points that must be considered are method and time of application, the quantity, and the placement of the fertilizer.

Where fertilizer is applied by hand great care must be taken to insure that there is a uniform application particularly with row crops where there is often a tendency to over apply fertilizer at the beginning and under apply at the end of the row. Hand application works well where the fertilizer is to be surface applied and particularly where the applicator has a certain amount of skill. Greater uniformity and faster application can be obtained with machine spreaders, but these are only feasible for large areas.

Fertilizers must be applied in time so as to be of maximum benefit to the actively growing plant. Very often farmers delay fertilization too long after germination of the crop so hindering early rapid growth and allowing for unfavorable weed competition. Fast growing, short term crops such as corn, tomatoes and beans need nutrients early and rapidly so that all or most of the required fertilizer should be applied at time of planting. For slower growing fruit and tree crops fertilizers are applied at varying stages in any one year of the plant's growth.

In areas of heavy rainfall and soils of low organic matter as occur in some parts of the V.I., small and frequent applications of fertilizer are more effective than one or two heavy doses. This practice is particularly essential during the wet months of the year in the V.I. when greater losses of fertilizer, particularly nitrogen and potassium can occur by leaching.

How much fertilizer to use? This is a question most often asked by farmers since they wish to get optium yields with the minimum amount of fertilizer. Even with the same crop fertilizer recommendations can vary widely from place to place. Soil and plant analyses are two basic tools that the researcher must use in order to determine the best fertilizer composition and rate for a particular crop. These can be extended to the farmer in terms he can understand. Where fertilizer is applied by hand it is difficult to uniformly apply less than 400 kgs/ Ha rate particularly for row crops. For this method therefore low analyses fertilizers are more effective. With machine application low application rates (200 kilograms per hectare) of high analysis fertilizer can be made very effectively.

Placement of fertilizer is another aspect of fertilizer application that is critical to the farmer. Above soil placement is often easier and quicker than soil incorporation of fertilizers, but the former method can lead to inefficiency. Heavy rains can wash away most of the fertilizer and in high pH soils (above 6.5) under high sunlight most of the nitrogen in ammoniacal fertilizers can be lost by volatilization. Surface application is therefore advisable only for pastures and certain tree crops where it is impractical to cover the fertilizer with soil.

Soil incorporation of fertilizer is therefore advisable in most cases but is essential for phosphorous. Most phosphate fertilizers are slowly soluble and move slowly in the soil so that they must be placed close to the roots of the plant, very often beneath the planted seed. Where machines are not used for fertilizing, fertilizers can be hand applied and then very effectively hoed or disked into the soil. Ammoniacal fertilizers should be covered by at least 4 cms. (approximately 1½ inches) of soil.

SOIL FACTORS

Light textured soils are most subject to leaching of nutrients than heavier soils so that it is more efficient to apply several smaller doses of fertilizers in the former soil types than large single applications.

Organic matter helps to hold most nutrients in the soil in a form that is easily available to the plant roots. Soils

low in organic matter will therefore require more fertilizer for optimum crop production. Incorporation of organic matter not only improves soil structure but will also increase fertilizer efficiency.

High pH soils as occur in many parts of the V.I. can lead to high losses of nitrogen by volatilization from common ammonium fertilizers such as urea and ammonium sulphate if these are placed on the soil surface. In addition many nutrients, particularly the minor elements are tied up and non-available to plants in such soils. Such minor nutrient deficiencies must be identified and corrected before the proper absorption of fertilizers can take place.

Soil compaction is another factor that can cause reduced fertilizer absorption and plant growth. This can easily occur with the repeated use of heavy farm machinery particularly when the soil is wet.

Optimum soil moisture is also important for the proper absorption of nutrients from applied fertilizers. When soil moisture is deficient applied fertilizer is of little use to the plant. In these circumstances irrigation can improve the efficiency of fertilizer. On the other extreme flooding and/or poor drainage of the soil can cause oxygen starvation of the roots and reduce their ability to absorb nutrients.

High soluble salts in the soil is a chemical factor that can cause an unbalanced condition and deter roots from effectively absorbing applied fertilizer. Soil pH and soluble salts are always given in the routine soil test so that the farmer can be made aware of these soil conditions and take the appropriate measures.

PLANT FACTORS

Fertilizer rates, composition and methods of application will vary from crop to crop. Short growing crops such as tomatoes and onions will require most of their fertilizer at an early stage and only rapidly. Fertilizer applications will be spread out over a greater period of time for tree and fruit crops. Knowing the fertilizer requirements of a particular crop will certainly help the farmer use his fertilizer more efficiently.

A healthy root system is essential for good absorption of nutrients. A farmer can be literally pouring his fertilizer down the drain when the roots of his plants are damaged by pests, bad drainage, or soil restrictions. He must be able to detect and correct these deficiencies before getting the full benefit from his fertilizers.

Very often a farmer will apply extra fertilizer to insect infested or diseased plants in the hope that they will recover. The foliage of the plant is needed for the vital

processes of food manufacture and the roots serve as the system of absorption for all soluble inorganic nutrients. When the foliage or roots are damaged or reduced by pests the growth of the plant and the efficient utilization of applied nutrients are adversely affected. Nematodes are a common pest affecting the roots and their effective absorptive capacity of many crops in the Virgin Islands. Control of nematodes will give healthier roots which can then more efficiently utilize applied fertilizers.

Weeds in a farmer's crop can compete severely not only for space, light and water but also vital nutrients. Early and good weed control will ensure that the fertilizer intended for the food crop will not be all or partially absorbed by invading weeds.

STORAGE

Storage of fertilizers especially under tropical conditions can be a major factor in the loss of their effectiveness. Whenever fertilizers are bought in large amounts that are not used immediately proper storage is extremely critical.

A fertilizer shed or storeroom should be completely waterproof. Whenever fertilizer bags are stacked they should preferably be placed upon wooden pallets to allow for adequate air circulation. Stacking of more than 10 bags upon one another creates excessive weight which compresses the fertilizer in the lowest bags into cakes or hard blocks so reducing its effectiveness. Fertilizer bags older than one year also become old and caked and should be used before this time.

Where fertilizers are to be stored temporarily in the field they should always be covered with a waterproof material or plastic sheet, making sure that the bags are never resting directly on the bare ground. It is important at all times to keep moisture out of stored fertilizers, if they are not to be damaged and their effectiveness reduced.

The Frangipani Worm - Take It or Leave It?

By Walter I. Knausenberger and R. Dean Cosper
C.V.I. Cooperative Extension Service

Almost every year, many Virgin Islanders discover enormous yellow-banded black caterpillars feeding, often in large masses, on their frangipani trees. **(Plumeria rubra and P. alba).** And every few years, outbreaks of these "frangipani worms" are so extensive as to cause widespread concern. This was the case in 1981 on St. Croix and in 1978 on St. Thomas. Usually, these occur between May and September. In as little as 10 to 14 days, a tree may be completely stripped of leaves (but 20-30 days is more usual). The sweet-scented flowers generally are not eaten by the worms. Rarely will a given location have a serious infestation two years in a row, but every year there is at least a small outbreak somewhere on these islands. However, as we will explain below, you need not normally be too concerned for the health of your frangipani trees, because even if the worms eat all the leaves, the trees most likely will survive well. Similarly, the "worms" themselves are no threat to human health in any way, because they can neither sting nor bite significantly, and their droppings are not poisonous.

The discussion that follows will give some background about one of the largest and most striking caterpillars to be found anywhere, and about its host. Surprisingly, almost nothing seems to be written on this insect, either in scientific or popular literature.

Frangipani worms and trees (about 50 species) are native to the Caribbean region. The tree is now a widespread and popular ornamental throughout the tropics, but the worm apparently causes outbreaks only in its native region. The many-hued flowers of various frangipanis introduced on Pacific Islands quickly were adopted for making flower necklaces (leis). Besides their beautiful flowers -- a source of the red jasmine perfume, the trees' unique open-branched appearance, their drought-tolerance, general hardiness, and ease of maintenance explain their popularity. Another contributing factor is ease of propagation--stem cuttings will take root if merely placed on the ground.

The only significant frangipani pests here, for all practical purposes, are the frangipani worm, an armored scale insect called the "greedy scale" (because it infests so many different hosts!), and a yellowish-orange rust fungus **(Coleosporium plumeriae).** This rust infects the undersides of the leaves, forming powdery circular pustules which may coalesce and become extensive enough to cause the leaves to turn yellow and drop prematurely. However, if the condition is encountered soon enough, it can be controlled readily by applying a metal-containing fungicide, such as mancozeb (e.g. Dithane M-45), zineb or maneb. Trees infected by this fungus seem to be free of frangipani worms.

The frangipani worm, known scientifically as **Pseudosphinx tetrio,** belongs to the family Sphingidae, which includes the tomato, cassava, and papaya hornworms. As adult moths, these hornworms are known as "hawk moths", or "sphinx moths". Frangipani hornworms feed almost exclusively on leaves of Plumeria, and grow to a voracious 5-6 inches in length. The worms sport a red head, bright yellow bands on a velvet black body, and a black whip-like protection (the "horn") on an orangish rear end (Fig. 1). This "horn", which may be whipped back and forth, perhaps appears to some people to be a large stinging device, but is completely harmless. As a visual display and frightening device, it probably helps ward off predators such as birds.

Fig. 1. Spectacular frangipani "worm" is actually a caterpillar which can grow up to six inches in length.

The life cycle begins with the large (5-inch wing-span) dull-grey moth that lays the egg. This hawk moth is a strong and rapid night flier which spends its days resting on the bark of trees. The color of the moth is a camouflage, and allows it to rest unnoticed by birds which otherwise might find this stage of the insect appetizing. The eggs are whitish to cream-colored (darkening when about to hatch), cylindrical to spherical, about 1/8th of an inch in diameter, and are deposited in small clusters of 5-25 eggs (Fig. 2). Hatchling worms are about ¼ inch long. This tiny caterpillar will moult five times and increase 20 times in length and probably 400 times in weight. A few days after it reaches full size (3-4 weeks), the worm drops off the tree to change into the

pupal stage in the soil, where it will transform into the adult moth.

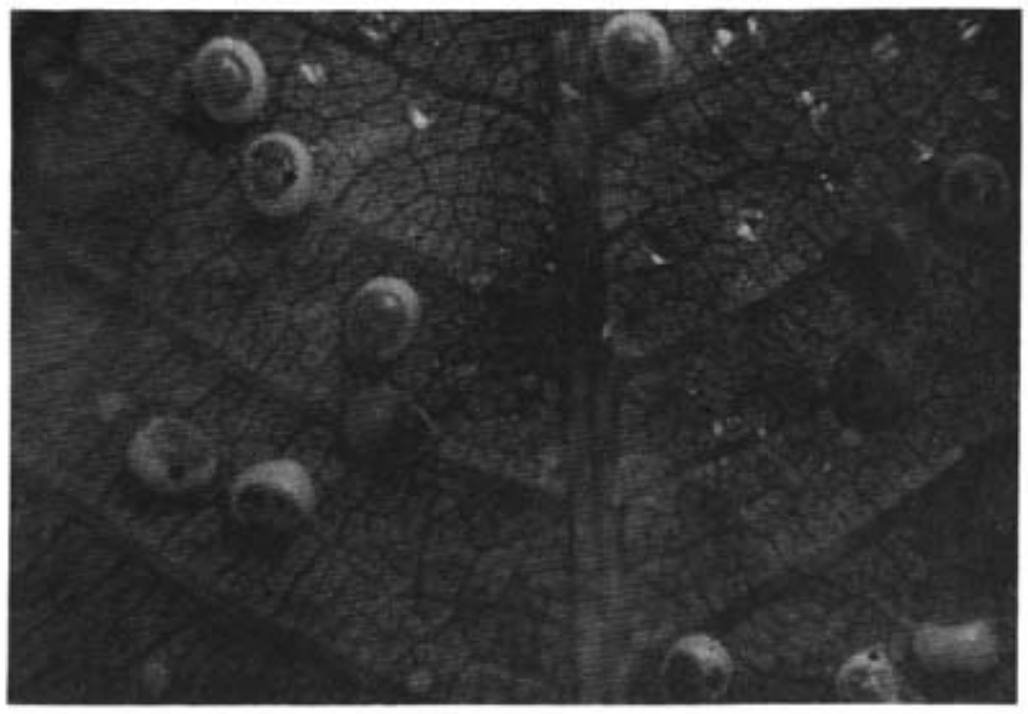


Fig. 2. Egg cluster of frangipani worm shown on frangipani leaf (greatly enlarged).

Most of the caterpillars will enter shaded soil near or under the frangipani, but some will migrate quite a distance from the source. The pupa is 2-3 inches long, dark brown glossy, with a bluntly rounded head end and a pointed tail end which the insect can move in corkscrew fashion to burrow into the soil. This is the stage least likely to be seen. The pupal stage lasts approximately three weeks before the moth emerges, if it is still early in the season (May-August). Thereafter, more and more pupae apparently enter into a form of dormancy (or hibernation) in the soil, until the next spring rains begin, when the moths will emerge to begin the cycle again.

PROTECTED BY MOTHER NATURE

Frangipanis contain a milky thick sap which flows profusely when a leaf is broken off or when the stem is cut. The word frangipani is adapted from one of the meanings of the French "frangipan", referring to a form of evaporated or coagulated milk (described, among other places, in a mid-nineteenth century medical dictionary). In some people, the sap can cause skin rashes not unlike those of poison ivy, mango or monkey puzzle. The sap therefore should be washed off promptly if it gets on the skin or in the eyes.

This same sap strictly limits the number of insects that can feed on frangipani. It is either toxic or unpalatable to most any animal other than the frangipani worm, which has evolved a tolerance of the sap. The toxic chemical element is incorporated into the caterpillar's tissues. The worm's conspicuous colors therefore are an announcement to potential predators that it is distasteful. Predators soon learn to associate the bright colors and conspicuous pattern of the frangipani worm with an unpleasant taste to be avoided. This phenomenon is known as "warning coloration", or aposematism. According to the theory of natural selection it is because such characteristics ensure an increased chance of survival that they become established.

So, without an adequate number of natural enemies to keep the frangipani worms in check, the worms defoliate entire trees rapidly under ideal weather conditions. The only natural enemies we have observed personally to date (other than a famished dog eating them off the ground under a frangipani tree!), are very tiny parasitic wasps emerging from the eggs (Fig. 3). These wasps are being identified by specialists at the U.S. National Museum. Quite possibly, the egg parasites play a significant role in the regulation of the frangipani worm population during non-outbreak years. The other most likely factor involved in the control of the worms is wet weather--the wetter the soil stays for a prolonged period, the more the insects will succumb either to drowning or disease related to wetness.

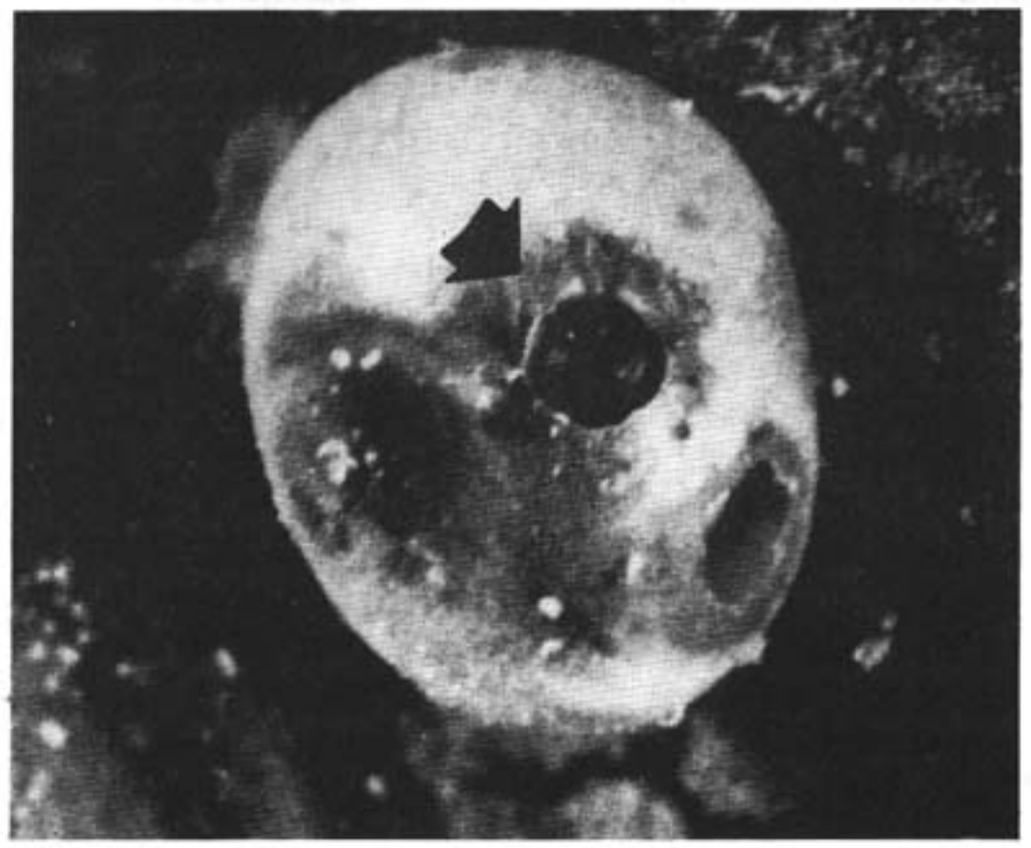


Fig. 3. Tiny parasitic moth emerges from caterpillar egg.

WHAT TO DO ABOUT THEM? MAYBE NOTHING.

Control is readily achieved by hand-picking from small trees. On large trees a fruit hook or wrapped stick might be used to knock the worms to the ground, where they may be collected and destroyed by drowning in a bucket of soapy water, and then burying in your compost. For truly heavy or large-area infestations, especialy if the abundant droppings accumulate on walkways and other living space, insecticidal intervention may be justified. An excellent material, and one absolutely harmless to humasn, animals or most other insects, is a bacterial preparation such as Dipel or Thuricide. This material causes a disease which infects only the caterpillar stage of certain moths and butterflies that feed on the treated leaf surfaces--in this case only the frangipani worm. The bacterium paralyzes the gut of the worms so they will starve to death in only a few days. Feeding stops within 24 to 48 hours after treated leaves are eaten.

Even though the frangipani worms may defoliate a tree entirely, this defoliation will not kill the tree. New leaves will develop readily, but these should be protected, because the frangipani, like any other tree, does not have

unlimited reserves. Repeated defoliation in the same season, or over several seasons in succession, may weaken a tree to the point that it may not survive the normal period of dormancy during the dry season in the V.I., where most frangipani trees lose their leaves naturally anyway. But this is unlikely to happen to the extent that treatment would be required to save the tree. So it is really a matter of personal preference whether to destroy the worms or to allow them to remain. The most you would normally lose is the leaves affected, but you would gain the opportunity to experience a dynamic but benign phenomenon of nature, and to observe one of the larger jewels of the Caribbean insect world. Either way you choose, there is an aesthetic benefit.

Role of the Compost Pile in Intensive Gardening

By Jose Torres *

The moment intensive gardening is mentioned the mind recalls intensive cultivation as if this is implied. Both practices combined are best suited for a limited operation--a small garden plot. For the purpose of our discussion we may define a small garden plot as an area of about one-eighth to one acre of land.

Usually the first concern in gardening should be soil preparation. I would start with the preparation of materials for a compost pile with any discarded vegetable material, leaves, grass trimmings, kitchen scraps, wood ashes, and manure if available, to fill the bill of fare. Ideally a compost pile should be started six months before the planting date.

To build a compost pile dig four poles in the ground placed about 4 feet by 6 feet and one foot deep. Set in four 6-foot stakes, fence three sides half way up with discarded galvanized sheets and the rest with salvaged chicken wire. Leaving one open side is very convenient for dumping in and forking the materials which should be turned over at two months intervals or sooner depending on the temperature which is to be kept around 130 degrees fahrenheit. Higher temperatures may burn the material and you'll end up with a heap of ashes. It has happened to me. Concrete blocks or wood planks may be used, but for convenience and economy galvanzied sheets are best.

Punch as many holes as possible, about one inch in diameter, on the galvanized sheets to provide ample aeration for the bacteria to break down the fibers. Bacteria beneficial to plants work best with good oxygenation and so decomposition can be kept under control. The best site for the compost pile is a spot away from the planting area in a shaded location, under a tree if possible, where it can be kept going year-round so as to always have a good supply of compost. By using such a location, space that could be planted on would not be compromised. Build up layers six inches thick of material previously chopped and dried in the sun. Seeds in weeds will present no problem since these will also be decomposed. Between layers scatter about ten pounds of manure and about two pounds of a complete fertilizer (6-6-6) mixed with fine, sifted topsoil to add to about one inch over the whole area. Additional alternated layers may be built up as necessary or as materials become available.

A mound of good topsoil may be made along the three fenced sides to help retain run-off. I have obtained very good results by planting cucumbers or tomatoes on this mound on the outer perimeter of the pile and tying the vines or stems to the chicken wire previously mentioned.

A good bit of the juices from the pile seep out and anything planted around the sides takes a free ride. The pile should always be kept moist, but not too wet. The fertilizer, manure and soil act as innoculants or activators and greatly assist the microorganisms in the process to decay the vegetable residues. This process takes between three to six months depending on the particular method used. The coarser the chopping of the vegetable residues or the lesser the innoculants incorporated, the longer the period of the composting process. Since insects, earthworms, millipedes and other organisms play an important role in the composting process, never spray with insecticides on or around the compost pile. Frequent forking over will discourage rats and other vermin unwanted in the heap.

Giant bunch of bananas raised by Jose Torres (right) on his farm attests to the benefits of composting. Looking on is CVI extension horticulturist Clinton George.

A hundred pounds of discarded vegetable materials will produce not more than a few pounds of completely decayed compost but is well worth the effort at harvest time. A few spoonfuls mixed in the planting hole will do the trick or if a sufficient quantity is available, ten to twenty pounds for every 100 square feet can be scattered over and then forked into the soil. Compost also has been used as mulch or in combination with it. For the latter

*Mr. Torres and his wife were chosen Farm Family of the Year at the 1981 Agriculture and Food Fair.

practice compost needn't be completely rendered, for it will continue the decaying process while spread over the ground, but never incorporate it into the soil if planting is to be done immediately. In sandy soils, where intensive cultivation is not recommended, a combination of mulch and compost is unbeatable. In this instance the mulch will retain moisture in the soil by discouraging evaporation and the compost, once mixed into the soil, will act as storage for that extra moisture that does not evaporate or percolate. No undesirable odors will result from decomposing vegetable matter if done under controlled conditions.

The advantages of organic gardening can hardly be over-emphasized. However, extremes are always misleading. The rejection of modern methods such as the use of chemical fertilizers and safe, proven insecticides is a fallacy. These products if used judiciously can be of great help to the farmer, in many cases the difference between success and failure.

A plant cannot assimilate food from any source unless it is first broken down to its original elements, be this organic or chemical. Nitrogen will still be nitrogen whether obtained from leaves or synthetic salts, and there isn't significant difference between one or the other. Nor is there conclusive evidence indicating that crops grown "organically" are more resistant to disease or pest damage than similar vigorously grown crops using commercial fertilizers. If the end product of the compost pile were to be expended commercially it may not be legally labeled as a fertilizer, even though it contains small amounts of the three main chemical elements, but rather as a soil conditioner. The latter is by far more important since the majority of soils are more deficient in their physical structure than in fertility. Analysis of a soil may show no lack of the essential elements, yet it renders a very low yield. A good soil conditioner will surely correct this. In most of these instances what happens is that air and water do not reach deep or far enough to the tiny hair roots because of the tightness of the soil, thereby making the nutrients in the medium unavailable to the plant. This condition also affects the absorption of the minerals, some of which interact as catalysts in the assimilation of some of the nutrients.

In preparing this article, complicated terminology was avoided in order to present a more amenable reading to the un-initiated, to stir the interest of the average person and involve the greatest number of people in the fight against inflation. It may sound as cliche but bears repeating: a pound of food grown in the backyard in your spare time is a pound of food not imported. Also materials recommended are preferably salvaged from the junkyard, garage or in last resort, the garden shop. Fertilizers mentioned are locally available. Practices described are especially suited for our soils, inexpensive and easily performed by the lay person.

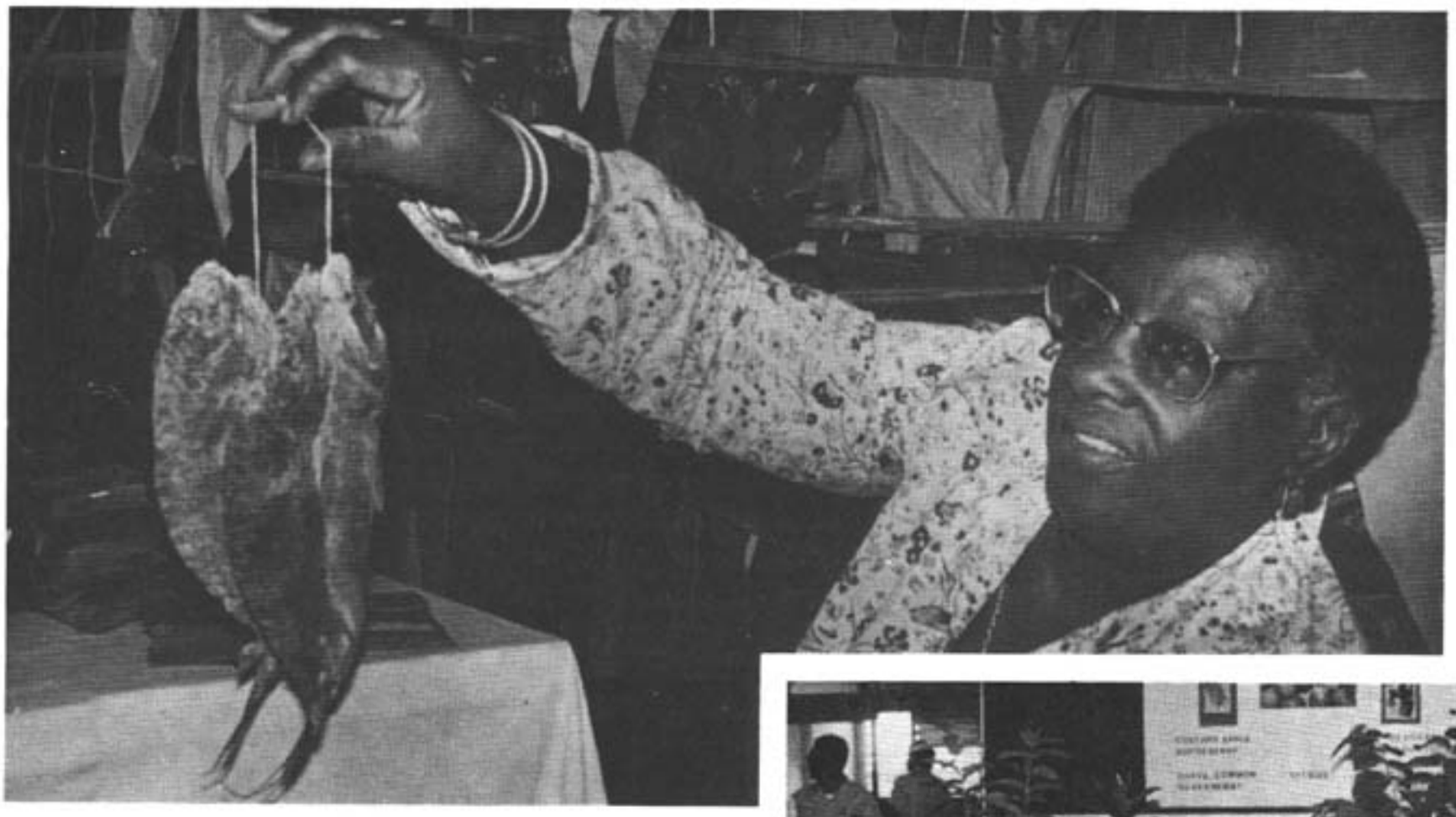
May your gardening endeavors be pleasant and productive.

From Our Photo Album By Liz Wilson

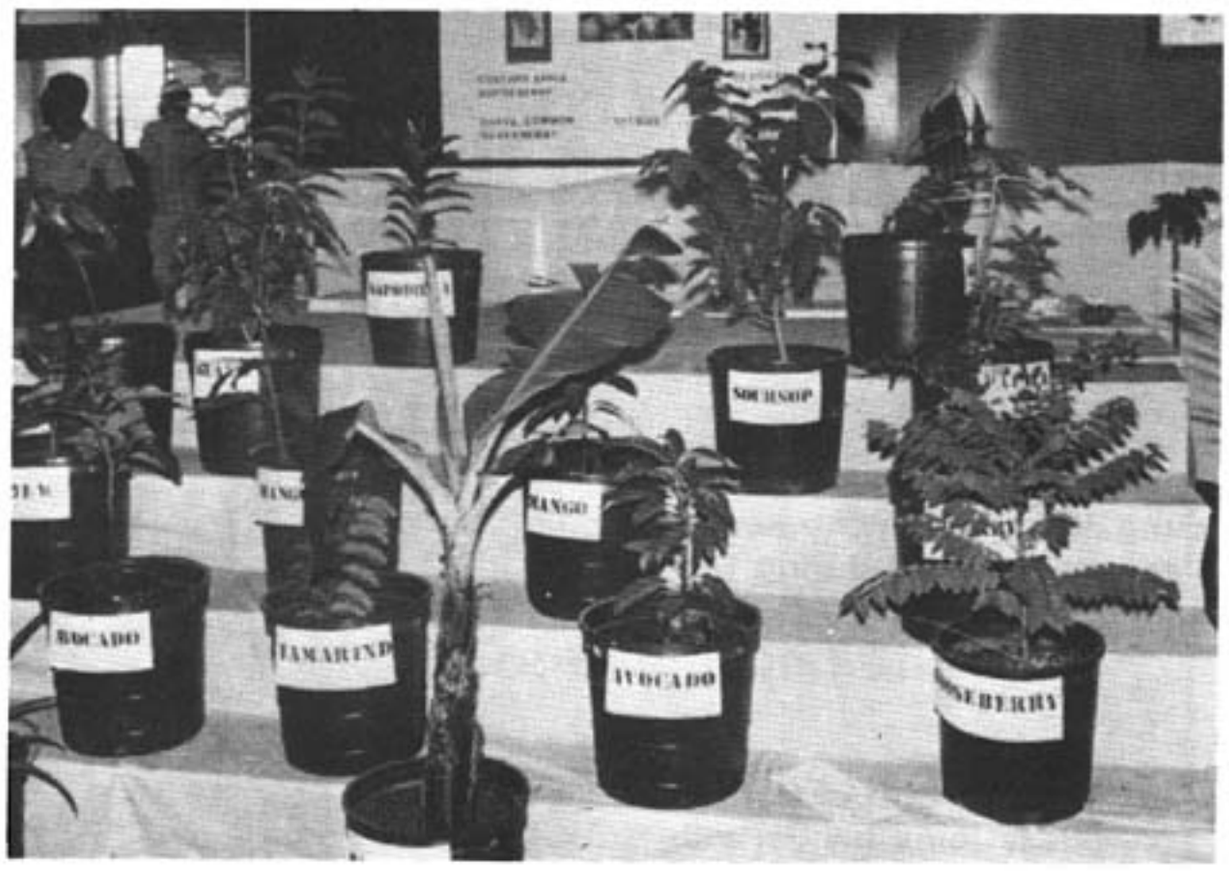
Young dancers stand by awaiting signal to entertain crowd during fair's entertainment activities.

Fair director of Caribbean activities Bill Bass joins hands with St. Kitts-Nevis exhibitors at 1981 fair.

Farm Family of the Year award winners Jose Torres and his wife display their beautiful clock award, assisted by Senate president Ruby M. Rouss, as fair vice-president Darshan S. Padda looks on.



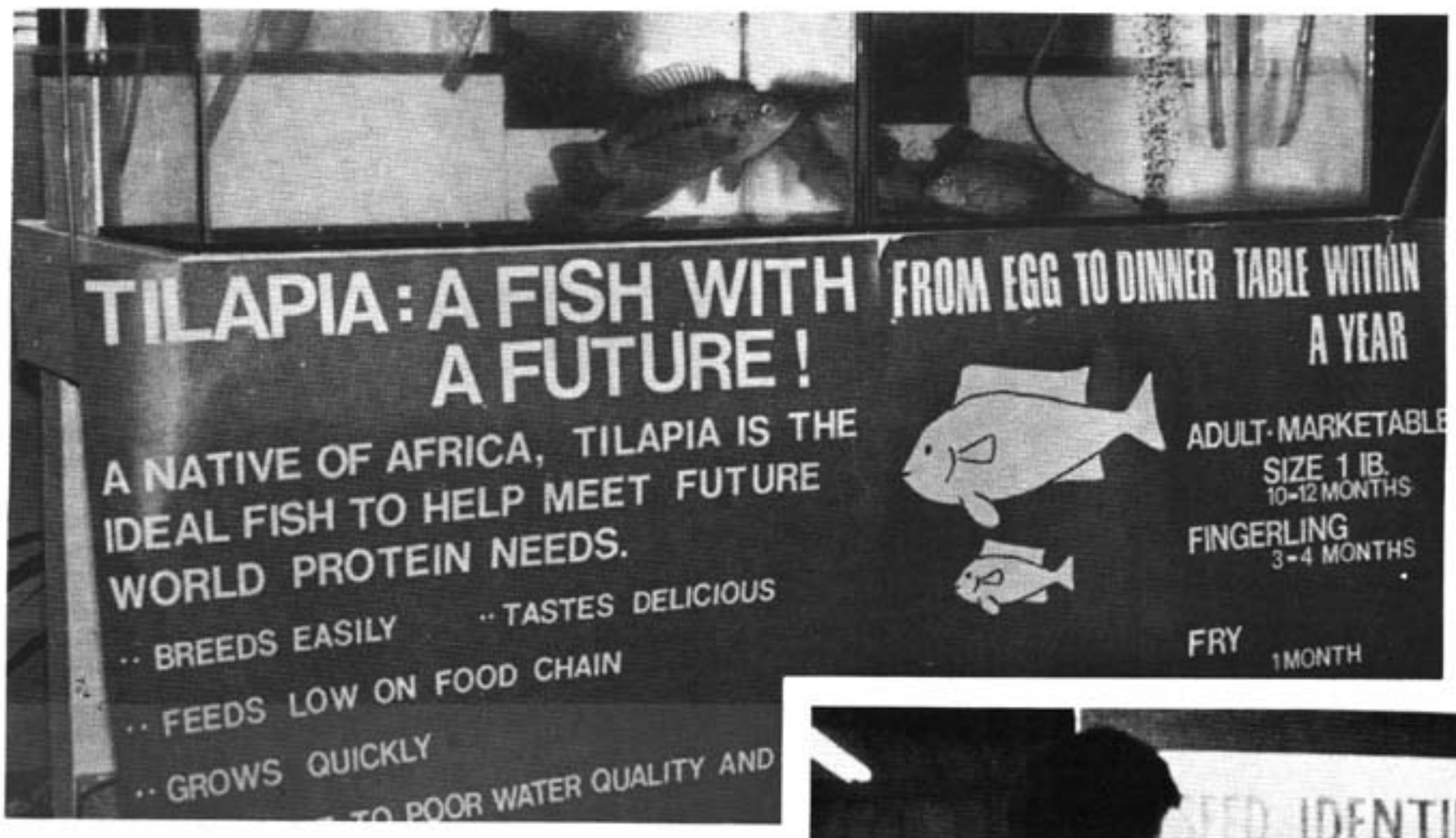
Arona Petersen, St. Thomas author, renowned cook and world traveler, dangles a pair of tasty salt fish which she prepared for food and preserve demonstration at fair.



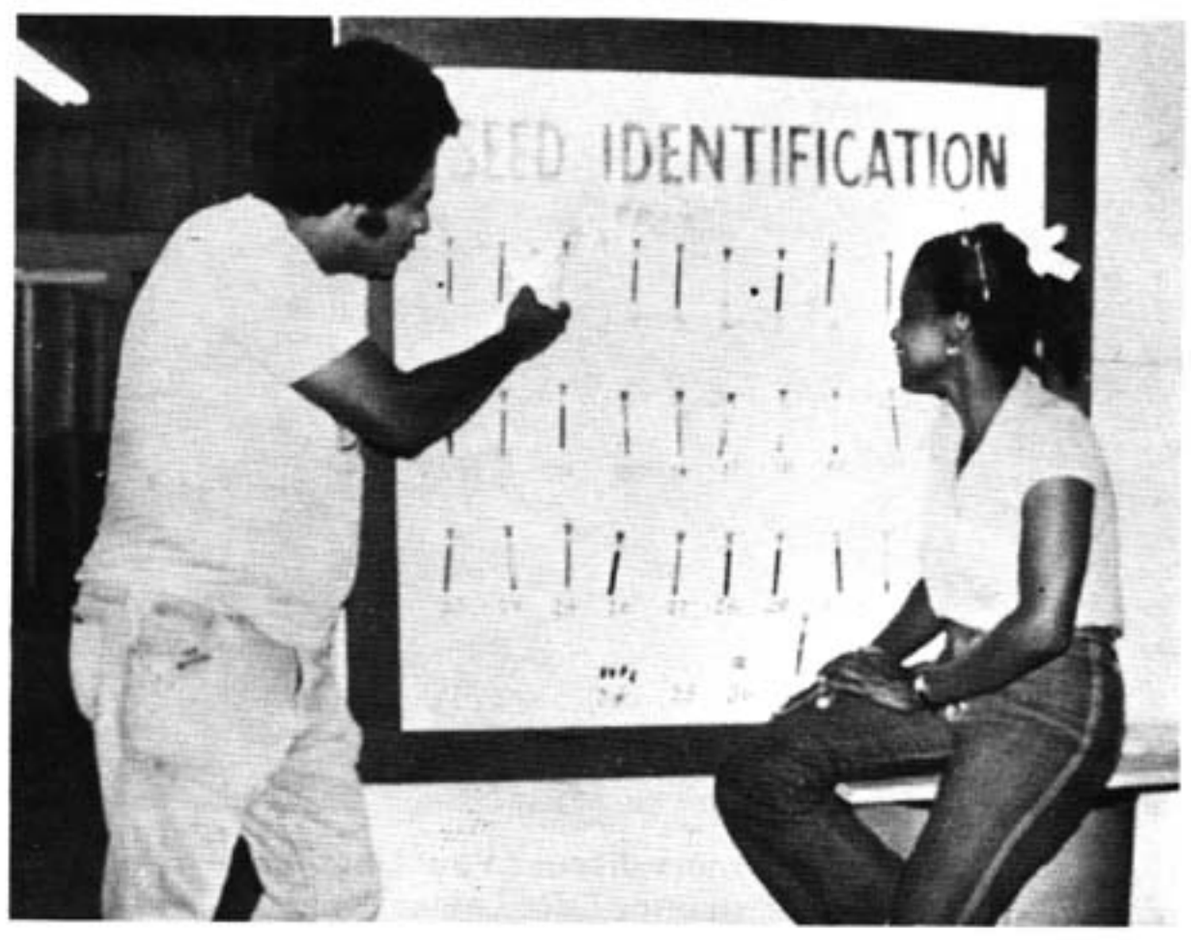
Island fruit trees were part of the extension agriculture exhibit.

Displaying their prize ribbons are two representatives from Tortola in colorful booth which exhibited produce from that island.

Well-known Virgin Islands culinary artists gathered to demonstrate their expertise at food fair demonstration. From left are Lena Shulterbrandt, Esther Moorhead, Alma Doward, Edith Bond, Arona Petersen, Margaret Carter, Amy McKay, Alice Petersen, Agatha Ross, Mary Joseph, Ingeborg Hector and Eglantine Isaacs.



Looking alarmed at being in such close captivity, tilapia freshwater fish are displayed to show fair visitors the potential of raising their own fish as a source of protein. CVI aquaculture program prepared the exhibit.



Seed identification display was prepared by agriculture department hoticulturist Michele Thurland. Looking on is fair superintendent Larry Bough.

Young Arawak Program farmers pose proudly with their calves and ribbons.

Sheltered Workshop displayed handmade dolls and preserves at 1981 fair.

St. Croix farmers discuss Paul Lindquist's exhibit of vegetables. With him are Charles Schuster and former senator Fritz Lawaetz.

Diseases of Dogs and Cats in the United States Virgin Islands

By Eugene A. Petersen, D.V.M.

Many problems confront the pet owners of these islands and can cause a cute little puppy or kitten to be a big headache and a source of frustration and heartbreak. Some of these problems occur naturally, such as infectious diseases, parasitic infestation, (worms, ticks, fleas, etc.) and skin problems. But many of the problems are created because of misinformation or lack of knowledge about the general care of our pets.

The axiom, "an ounce of prevention is better than a pound of cure", is very true in veterinary medicine and should be considered when one is acquiring a pet of any kind. Prevention and early detection of common diseases is the key to a good and healthy pet. A well-informed owner insures that a pet will receive proper care and attention.

The following description of diseases, their symtoms and treatment, is not an attempt to teach the reader to diagnose and treat diseases, but to make you aware of some of the problems affecting us here in the Virgin Islands. The description of some suggested therapy is only an attempt to improve your self-awareness and encourage one to seek proper assistance early in the course of an apparent problem.

INFECTIOUS DISEASES

Canine Distemper: This is caused by a virus that affects the intestines, nervous systems, and respiratory (lungs) system. It may cause inappetence (not eating), fever, discharge from the eyes and nose, twitching and shaking, paralysis, and death. This disease is very prevalent and dogs that recover may continue to show nervous symptoms of twitching and shaking especially in the head and jaws. Veterinary assistance is a must at the first appearance of symptoms and all young puppies should receive a series of vaccination to prevent this disease.

Canine Parvo Virus (CPV): This is a virus that affects mainly the intestinal tract, but can affect the heart of young puppies. Bloody diarrhea, severe vomiting, dehydration, fever, inappetence, and sudden death are all symptoms of CPV. Fluids (life water), antibiotics and good nursing care must be given as soon as possible by your veterinarian as a high percentage of young dogs will die from this disease.

CPV can cause sudden death in young puppies by affecting their heart which may lead one to think that his pup was poisoned.

Canine Ehrlichiosis: (Bleeding disease, Dog Tick Fever, Tropican Canine Pancytopenia) is caused by a blood parasite that is transmitted by ticks. Nose bleed, fever, pale gums, listlessness, poor appetite, and excessive bleeding from small cuts are all symptoms of Tick Fever. Sedatives, blood transfusion, antibiotics, and vitamins must be given by your veterinarian. Tick Fever is very unpredictable and may cause sudden death or prolonged sickness. Ticks must be kept under control to avoid this disease.

Midnight, the kitten, and Tan-Tan, the puppy, grew up to be strong healthy pets because they were vaccinated and wormed when young.

Cat Distemper (Feline Pancytopenia) is caused by a virus and the symptoms are similar to distemper in dogs, but the nervous symptoms are not pronounced or absent. Cats may recover from this disease with medication and good nursing care from your veterinarian.

Cat Leukemia: This is caused by a highly contagious virus. Pale (white) gums and nose, inappetence, lethargy, some nasal discharge, and labored breathing are symptoms of this disease. There is no treatment for this condition and cats that recover from the symptoms may remain carriers. A blood test must be performed by your veterinarian to confirm the diagnosis and, if positive, the animal should be humanely euthanized (put to sleep).

PARASITES

Fleas and Ticks: These are small skin parasites that cause constant discomfort to both pet and owner. They can transmit disease and cause skin allergies and severe dermatitis (inflammation of the skin). They can survive for extended periods (months and years), in rugs, grass, cracks and crevices, and many other places in the home. There are many preparations to kill fleas and ticks, all of

which are poisonous and should be handled properly.

Mange: There are two types of mange that are caused by very small mites that burrow into the skin. Demodex or Red Mange is the most severe and is very difficult, if not impossible, to treat in the advanced stages.

Sarcoptic Mange (Scabies): This is another type which causes excessive scratching and hair loss. Scabies is much easier to treat, but can also affect humans causing skin rash and itching. Treatment should be closely supervised by a veterinarian and recovery should be complete before treatment is stopped.

Intestinal Worms: There are many types of intestinal parasites but in the Virgin Islands we are affected by three or four major ones.

Hookworm: These are picked up in the soil and can penetrate the skin or be ingested. They migrate to the intestinal tract where they attach themselves to the walls and suck blood. Young puppies with severe hookworms can become anemic and dehydrated and die suddenly. Pups should be checked at 10-14 days of age and dewormed regularly if found to have parasites. Older dogs should be checked annually or semi-annually and be dewormed if necessary.

Roundworms: These are larger than hookworms and are picked up also in the soil by ingestion. They affect mostly puppies and in large numbers, can cause severe problems. Most medication for hookworms will also kill roundworms.

Tape Worms: These are transmitted from dog to dog by the flea and can cause obstruction in the bile ducts or intestinal tract. The eggs are eaten by the flea where they develop and when the flea is eaten by the dog, the tape worm matures in the intestinal tract. Specific medication is needed to treat tape worms and often must repeated several times to affect a cure.

Whip Worm: This is increasingly becoming a problem in dogs on St. Croix. They are small pinworms and cause severe irritation to the intestinal tract and anus. They cause a smelly diarrhea and a stool test must be performed to detect their presence. In severe cases, vomiting may occur but dogs recover well with medication.

Heart Worms (Dirofilaria): This is a parasite transmitted by mosquitoes. The adult worms reside in the heart and adjacent vessels where they cause obstruction to the flow of blood and interference with the function of the heart valves. They produce larvae (babies) which are called microfilaria. These larvae are picked up by the mosquitoes when they suck blood and are transmitted to other dogs when the mosquito bites them. Your veterinarian must do a blood test to determine if heartworms are present. Treatment involves a series of shots to kill the adult heartworm followed by tablets to kill the microfilaria. Advance cases are difficult to treat and the dog can die from the disease.

Fortunately, we have medication that prevents heartworms by preventing the larvae (microfilaria) from developing once an infected mosquito bites a dog. This medication must be given every day and dogs should be checked annually for heartworm disease.

It is clear to see that if one can avoid or prevent any of the common ailments that afflict our animals that we will enjoy a healthier and more appreciative pet.

Here are some general ideas about pet care that may vary depending on the animal but are good to follow as a general guide to pet care.

1. Check all animals for parasites and properly vaccinate before breeding.
2. Check all pups at 10-14 days of age for parasites and follow your veterinarian's instrustions thereafter.
3. Vaccinate and check for parasites at 6-8 weeks of age and follow the vaccination program suggested by your veterinarian.
4. Start Heartworm preventive medicine at 4-6

months of age and continue as long as the dog lives in an area where Heartworms are prevalent.

5. Routinely check dogs' skin for fleas and ticks and take proper measures to control them. Bathing in sea water does not kill fleas and ticks.

6. Any hairless and sore areas, especially on head and back, should be checked to eliminate mange. Excessive scratching could also mean mange or fleas are present. Note: We are also affected by many plant and grass allergies which must be differentiated from mange.

7. Give a veterinary check-up once yearly which should include vaccination, stool check and Heartworm Test.

COMMON TALES AND MISCONCEPTIONS

1. There are no worms under the tongue of your dog that affect its appetite and must be pulled out by pliers or other similar tools. That is the Lyssa which is a part of the tongue.

2. Salt water does not cure any skin diseases, especially mange.

3. Some herbs, oils, and weeds have minor effects on intestinal parasites and other conditions but are unpredictable and in most cases useless.

4. Gun powder does not make a dog vicious and cross.

5. Mercury (quick silver) does not prevent dogs from being poisoned and, in fact, is poisonous itself.

6. Distemper vaccination is to prevent the dog from getting Distemper Disease and does not affect the dog's temper or behavior.

7. Do not give cats aspirin, dips or spray with any other chemicals unless you check with your veterinarian.

Diagnosing Your Soil Problems

By Kim Steerman
Soil Specialist
C.V.I. Cooperative Extension Service

The Cooperative Extension Service of the Virgin Islands is constructing a soil diagnostic testing laboratory to assist islanders in determining their soil problems. The laboratory is located in the New House building at C.V.I. on St. Thomas, and will serve St. Croix and St. John, as well as St. Thomas.

Since soil is the source of nutrients for plants, a soil testing program is essential to the improved management of Virgin Island agriculture. Because of the wide variety of soils present in the Virgin Islands, it is important to chemically classify these soils so that soil fertility problems can be recognized and corrected. One of the objectives of the Cooperative Extension Service is to chemically classify the soils on St. Croix, St. Thomas and St. John. This will complement the existing Soil Survey book on the Virgin Islands published in 1965 by the Soil Conservation Service.

Soil - What is it?

Farmers and home gardeners have genuine interest in the status of their soils. Soil is the reservoir from which plant roots draw essential elements and water to the vegetative and flowering parts of the plant. The term soil refers to the outer loose material of the earth's surface, a layer distinctly different from the underlying bedrock. This region of the earth's crust, known as soil, supports plant life by mechanically supporting the plant as well as supplying most of the nutrients the plant needs.

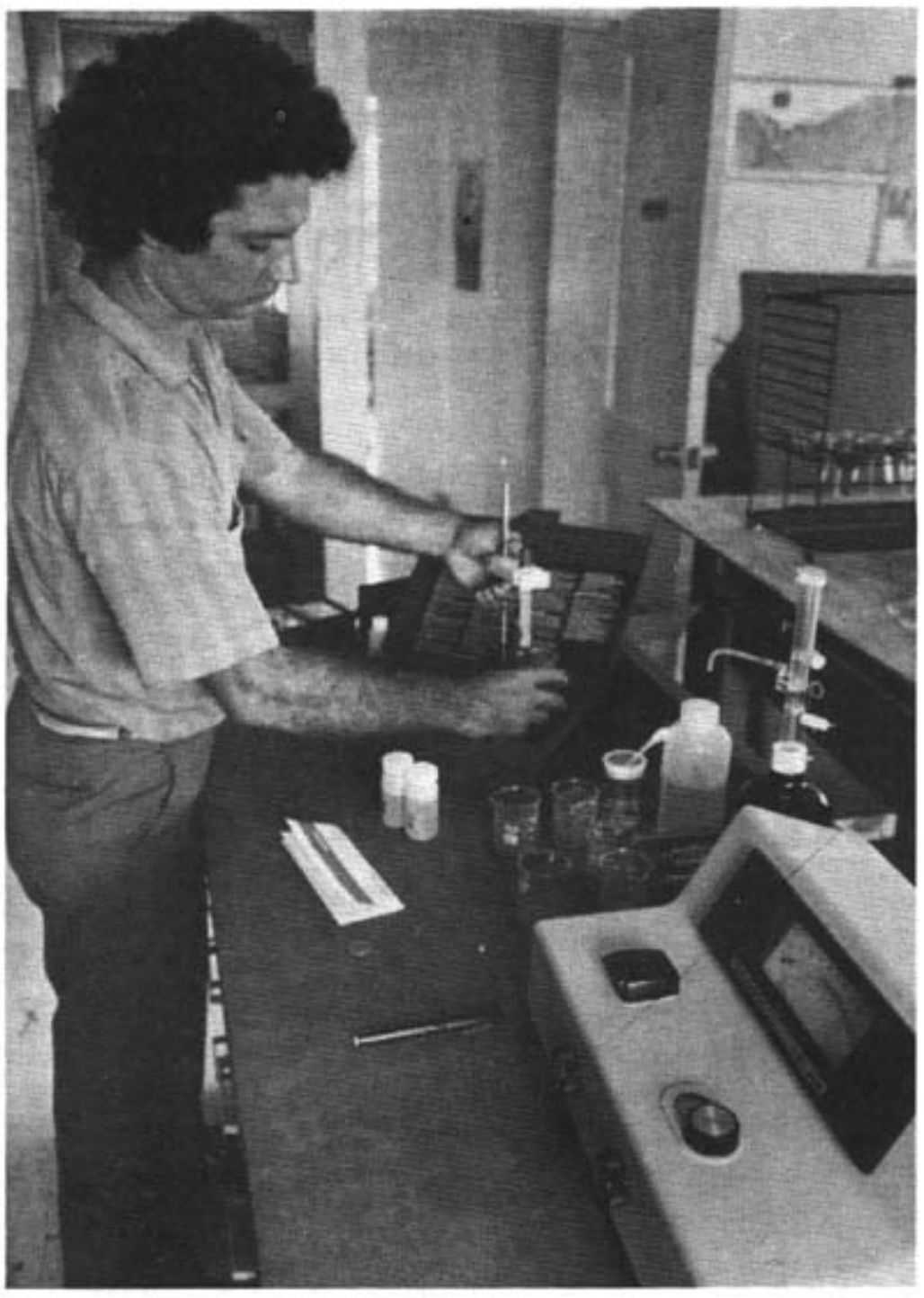
The soil is composed of five major components: mineral matter, water, air, organic matter, and living organisms. The mineral fraction generally comprises 45% of the total volume of soil, while organic matter constitutes from 2 - 6%. The remaining 50% of the soil volume is termed pore space, which is filled with both air and water. When the soil becomes saturated with water, there is no room for air in the pore space, and the soil is termed anerobic.

What is a Soil Testing Program?

The soil testing program consists of five major steps: sampling, sample preparation, extraction, analysis, and recommendations. The major source of error in this program is most likely to occur in the initial step, the actual sampling.

There are thousands of pounds of soil in a garden plot and a soil sample consists of only a half of a pound of soil. Therefore, the probability of a misrepresentation of the total garden plot exists, if one does not carefully represent the garden by taking several samples and mixing them into the composite sample. It is impossible to analyze all of the soil, therefore it is very important that the sample is representative of the area involved.

In each area, where the soil is similar in color, texture, and relief, a number of samples are taken and mixed into the composite sample. From this composite sample a half of a pound of soil is taken to the extension service for analysis. If the soil varies in color, texture, or relief a new sample must be taken for that specific soil, so that two or more samples might be required to characterize an area of soil. The soil sample is usually taken to a depth of 6 - 8 inches.



CVI extension soil specialist Kim Steerman is shown analyzing a soil sample in the new testing laboratory on the St. Thomas campus.

After the soil is received by the Extension Service it is dried and passed through a 10mm sieve to assure the extraction of a uniform volume of soil. Extraction, the next step, is the process by which the available nutrients are removed from the soil particles and suspended in solution. This is accomplished by adding various chemicals to the soil and agitating or stirring the soil solution mixture. The soil solution is then filtered and

analyzed for the elements of interest. The final step consists of recommending fertilizers, based on results from plant soil studies for a specific crop.

What does a Soil Test tell you?

The soil test is a chemical method for estimating the nutrient-supplying power of the soil. It reveals the status of the soil, whether it is balanced, deficient or toxic in regard to the various nutrients. Specifically, the soil test results report pH, organic matter, soluble salts, nitrogen, phosphorous, potassium, calcium, magnesium, sodium, boron, copper, zinc, iron, manganese, and sulfur. Also, it tells whether calcium and magnesium are balanced, as well as magnesium and potassium. The pH measurement is the most informative of all the measurements, showing whether the soil is acid or alkaline. At pH 7, the soil is neutral; as the pH rises above 7, the soil becomes more alkaline. The optimum pH for most crops is between 6.5 and 7.0.

Organic matter content indicates how much nitrogen may be supplied from the mineralization process in the nitrogen cycle. Soluble salts reach toxic proportions in some Virgin Islands soils and cause salt burn to plants. Generally, Virgin Islands soils are alkaline with a relatively high salt content. These problems can be remedied by adding elemental sulfur to the soils which forms sulfuric acid, reducing the pH. Leaching of the soil by a heavy rainfall or irrigation treatment will result in ridding the soil of toxic salt levels. However, some problems arise from the salt spray from ocean winds burning the foliage of plants, especially young, unestablished plants.

The remaining soil analysis consists of measuring individual elements, all of which are important in a balanced soil fertility plant nutrition program.

Island farmers and home gardeners will find the soil testing program a useful and necessary component to assist them in their agriculture efforts. For answers to questions on soil problems, call your local extension office on St. Croix and St. Thomas.

ELEMENTS DIAGNOSED BY THE SOIL TESTING LABORATORY

Element	Function	Deficiency symptoms
Nitrogen	Indispensable constituent of amino acids and proteins. Provides for leafy, green growth.	General yellowing of leaves and slow growth, occurring in older leaves first.
Phosphorous	Essential for energy transfer and fruit and seed formation.	Dark blue-green leaves possibly with red or purple veins. Slow growth. Appears in older leaves.
Potassium	Helps resist drought and lodging. Activates enzyme systems.	Margins of lower leaves appear yellow and may develop grown spots. Slow growth.
Sulfur	Essential component in some amino acids, also present in enzymes, vitamins, and other essential organic compounds.	Yellow, chloritic leaves. Appears in lower leaves first. Resembles nitrogen deficiency.
Calcium	Important in cell elongation and cell division.	Failure of terminal buds to develop.
Magnesium	Part of chlorophyll molecule necessary for photosynthesis.	Yellow blotching beginning at tips of leaf and on lower leaves first.
Boron	Essential for proper cell development and normal growth, flowering and quality.	Cessation of growth of terminal bud, followed by younger leaves turning pale green at the base (rather than the tip).
Iron	Indispensable for chlorophyll synthesis. Component of enzymes and carriers operating in the respiratory system.	General yellowing, appearing first in younger leaves. Leaf tissue between veins turns yellow while veins remain green.
Zinc	Involved in enzymatic activity, chlorophyll synthesis, carbohydrate transformations, and growth promoting substances.	Small yellow leaves that may turn brown and drop.
Manganese	Associated with chlorophyll synthesis, nitrogen metabolism and carbohydrate breakdown.	General chlorosis of young leaves between the veins. Often gray spots or streak on leaves and upper system.
Copper	Found in combination with selected proteins in the plant. Plays role in respiration.	Young leaves first develop faded green color with a grayish cast. Necrotic edges may develop on edges.

Agricultural Systems of the Aborigines of the West Indies

By Alfredo E. Figueredo

Many scholars, when considering the agriculture of American aborigines, choose to make a distinction between 'vegetative' and 'seed' agriculture. The late geographer Carl O. Sauer was prominent among these, another eminent advocate being the anthropologist Donald W. Lathrap.

Sauer held that there were two original and distinct modes of agriculture in the New World. One of these, arising in the Mexican area, was based solely on the cultivation of crops propagated by their seeds; for instance: beans, maize, and pumpkins. The other, coming out of the South American lowlands, was based on the culture of crops propagated vegetatively; that is, by means of their cuttings or suckers: examples are manioc, potatoes (both 'Irish' and 'sweet'), and tanias. Lathrap has accepted Sauer's two distinct modes, and has emphasized both the antiquity and the importance of vegetative agriculture, which until recently lacked a champion. Most scholars formerly had emphasized only the importance of seed agriculture.

In truth, we have nowhere in the New World any pure system of agriculture, restricted significantly either to seed or vegetative propagation. In the Mexican area, work by David Davis of Tulane University has made a good case for the early presence of a 'vegetative' crop, manioc, in the heartland of 'seed' agriculture. On the other side of the coin, the most significant crop to appear in Peru's Early Horizon is maize—this, in the home of the potato!

To brush aside finally this artificial distinction between two modes of agriculture which, like East and West, are assumed never to meet, one could state decisively that if, as Lathrap proposes, the diffusion of agriculture from the Old World to the New was due largely to the spread of the bottle gourd **(Lagenaria)** from **Africa to South America,** then the origins of South American 'vegetative' agriculture are to be found in an industrial plant which is propagated by its seeds!

The agriculture of the aborigines of the West Indies included crops which were propagated both vegetatively and by their seeds. Neither group of crops can be said to have been more important than the other.

It is customary to divide the West Indies into two major areas, with different climates, flora, and fauna. The larger area is the Greater Antilles, which includes Cuba (by itself, half the landmass of the West Indies), Hispaniola, Jamaica, Puerto Rico, and the Virgin Islands. The Bahamas are distinct geologically, but for the purposes of the biologist or anthropologist, they are in the Greater Antilles. The Lesser Antilles is the smaller area, and this includes all the Caribbean: the small islands to the southeast of the Virgins and north of Trinidad (which is a **continental** island): examples are St. Martin, Guadeloupe, Antigua, Martinique, Barbados, and Grenada.

Early Taíno pottery bat head from Megans Bay, St. Thomas. The fruit bat was thought to represent the soul of the dead.

Before the settlement of the West Indies by Europeans, two major races of aborigines divided the islands between them. The more civilized of the two, the Taínos, were related distantly to the Arawak of South America, and occupied the Greater Antilles (including the Bahamas). Their less polished neighbors, the Caribs, also were related to the Arawak of South America, but much more closely so, as is to be expected from their greater proximity to the continent. The Caribs inhabited many of the Lesser Antilles and, late in their history, had conquered from the Taínos the island of St. Croix,

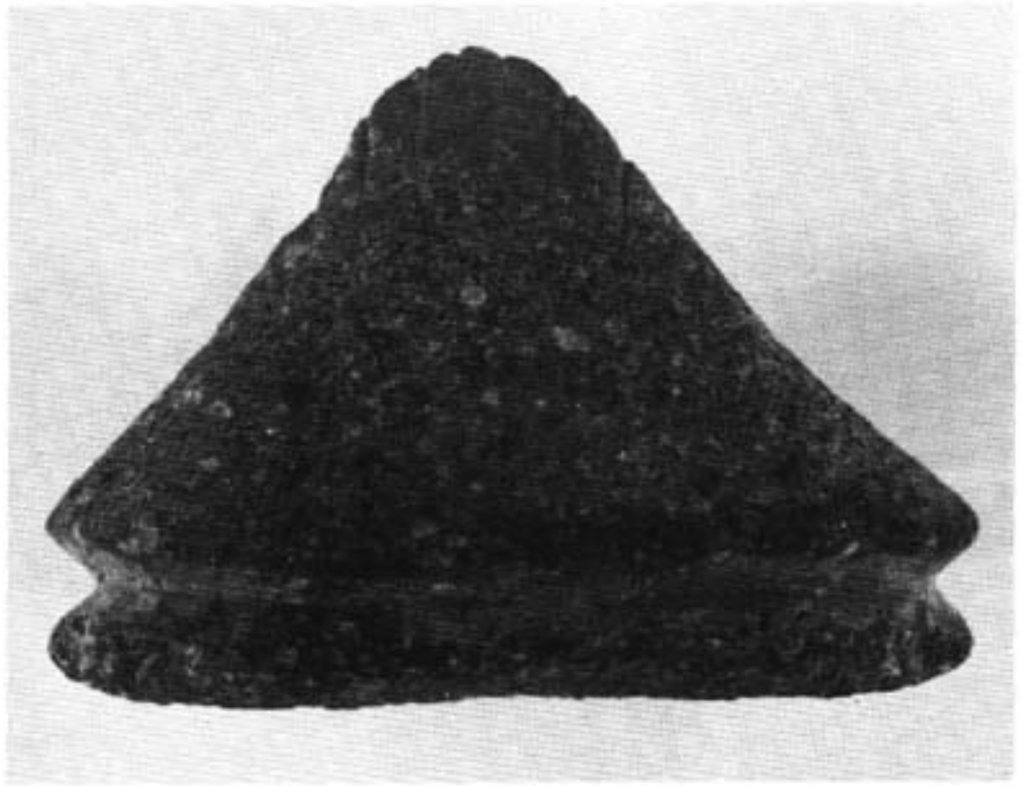
Alfredo E. Figueredo is the Administrator of the Virgin Islands Archaeological Society. His article is taken from a lecture he delivered at the College of the Virgin Islands Cooperative Extension Service on St. Croix.

gaining thereby a foothold in the Greater Antilles.

Most of what we know about these two aboriginal races (neither was ever a single political unit) is gleaned either from the rather dull work of archaeologists or from the writings of Europeans who were the contemporaries of the aborigines. Much of this information (of either kind) has yet to be published in detail, but of what is published the two most useful authors for the Taínos are the Spaniards Oviedo and Las Casas, and the Frenchman Breton for the Caribs.

The first valuable agronomical study of the Taínos was published almost a century ago by the famous Cuban scientist Alvaro Reynoso. Thirty years ago, his countryman Pérez de la Riva published another excellent treatise. The Caribs, less proficient agriculturally anyway, have not been favored by similar monographs.

The agriculture of the aborigines of the West Indies, taken as a whole, has been studied in detail also by the great Swedish archaeologist Sven Lovén, and the American ethnologist William C. Sturtevant. Sauer, another American and already cited, has devoted much attention to aboriginal agriculture in his controversial book, **The Early Spanish Main.**



Three-pointed stone from St. Croix was buried in the field by early Taínos to help promote growth of crops.

The Taíno agricultural system was complex and sophisticated. It included a wide array of food crops, of which the following were outstanding: manioc (both 'bitter' and 'sweet' varieties), sweet potatoes (many varieties), maize ('Early Caribbean' race, with multicolored grains), pumpkin, tania, peanuts, the 'common' bean **(Phaseolus vulgaris),** pepper **(Capsicum),** pineapples, guava, mammee apples, both 'sweet' and 'sour' sops, and many other fruits and roots of lesser importance. (Some crops common in the modern West Indies, which seem native because they are everywhere, such as avocados, caneps, mangoes, pigeon peas, 'sweet' limes, tamarinds, and yams are not endemic to these islands nor were they cultivated by the aborigines; they were brought in by Europeans during the Age of Exploration.)

Industrial, medicinal, or 'ritual' crops included tobacco, physic nut **(Jatropa),** cotton, 'bottle' and 'tree' gourds, annatto, and the hallucinogenic snuff cohoba **(Piptadenia peregrina).**

Taíno turtle pot from Virgin Gorda.

Animal husbandry was less well-developed among the Taínos. The most common domesticate, the dog (four of whom were met at the beach by Columbus' men when they landed on St. Croix), was not only a pet and a hunting companion, but it was eaten also; it was of a race which growled but never barked. Other domesticates raised for consumption include the guinea pig **(Cavia),** and the agouti **(Dasyprocta),** the former kept confined and the latter let go into the bush. An extinct rodent, **Isolobodon,** was kept in a manner similar to the agouti, and so perhaps was the iguana (both 'rock' and 'tree' genera). The only domesticated fowl may have been the parrot, which was valued as a pet and for its plumage, but there are persistent (if perhaps mistaken) reports of the presence of the common domestic fowl **(Gallus gallus)** in pre-Columbian America, including, of course, the West Indies.

Fish farming was conducted in inlets, particularly the mouths of rivers and streams, and coastal ponds; the only species of which we are certain is the mullet **(Mugil brasiliensis),** kept in 'fish corrals' until harvested. There is a record of a seacow **(Trichechus manatus)** in captivity, but as the pet of a chieftain.

This admirable array of food crops and minor domesticates, all of which are suited perfectly to the West Indian environment, was supplemented by extensive foraging from the wild. Fishing and hunting were of great importance, mollusks, fish, turtles, West Indian seal **(Monachus tropicalis),** seacows, and whales being taken from the marine environment (the last probably only when standed), while many now extinct or nearly-extinct species of insectivores, reptiles, rodents, and sloths were taken from the land environment. Wild birds and their eggs were important also.

Wild plants collected for food include the stem of cycads **(Zamia),** from which flour was made, prickly pear (a true West Indian native!), various wild yams—one of which is related to but not identical with the African cultivated yam, fruits such as hogplums, seagrapes, and the true grape, which exists here in several wild species and which the aborigines fermented into wine, as they did with many other things. Sisal and other wild fibers were collected for industrial uses, as were many hallucinogenic and medicinal plants.

The instruments used in this agricultural system were very few; a fire-hardened 'dibble' or digging-stick (called by them **coa**), and a stone hoe. The first of these, the digging-stick, was the main implement, whether for rooting in the wild or planting in the cornfields, for at least the last 7,000 years of aboriginal settlement in the West Indies. Simple, efficient, and changeless, it was indispensable in a society with neither steel tools nor the plow.

Through much of the Taíno area, cultivation followed the 'swidden' or 'slash-and-burn' system of rotating fields with woodland. Population pressure in restricted valleys, however, led to complex irrigation projects and permanent fields systems; the densely cultivated, thoroughly irrigated Xaraguá Valley in Hispaniola is a good example of the Taíno advances in this direction.

The planting of maize was done by poking holes in the ground with a dibble, dropping three or four seeds into each hole, and then covering the holes with earth using one's feet. A root crop such as manioc was planted on a small artificial hill (called a **conuco**) about six or seven feet across and one to two feet high. These hillocks were practically overlapping in fields of many hundreds or thousands of them, every one heaped up laboriously by men using nothing but dibbles!

On areas of a marked karst topography, such as the Bahamas or the Greater Antilles islands of Saona and Mona, and perhaps others, a 'pothole' system was used as may be seen practised still by the descendants of Puritans on Eleuthera, or by the rustics on Anegada. This means simply that where soil is to be found only in pockets amid limestone outcroppings, these widespread pockets (called 'pots' because they are often in shallow depressions) are cultivated, with no attempt to bring them together into united fidlds. The provision grounds of Saona and Mona, thus cultivated, were productive to a superlative degree.

All planting was timed to the lunations, always taking place on new moons so that, according to the aborigines, 'the crops would grow with the moon.' The varieties of maize and sweet potato were selected and planted keeping in mind their time to harvest, so that harvests would be staggered throughout as much of the year as possible. Varieties of maize, for example, matured after two, three or four months, while some varieties of sweet potatoes took as long as six months to mature.

Fertilizers, other than ashes and unripened green manure left accidentally from both clearing and burning, were unknown. Good yields of corn, according to Oviedo, depended on the variety planted, the soil, growing conditions, and so forth, but went from sixfold for an early variety on poor soil, to an-hundred-and-fifty-two-fold harvested in one of his estates.

A good sign of the advancement and complexity of Taíno agriculture is that men did both the clearing and the planting, as well as much of the harvesting and some of the processing of foodstuffs. In a primitive world almost unilaterally dominated by men (the Taínos had patrilineal succession), their dedication to agriculture entails its great importance: the Taínos could not survive without their crops, they were that removed from the easier life of gathering and hunting.

The Carib agricultural system was everywhere similar to an impoverished Taíno system, except that refinements such as permanent fields and irrigation were nowhere to be found. The importance of marine resources in the smaller islands of the Caribs, and their decided large scale practice of cannibalism due to a more restricted supply of animal proteins in their habitat, had one telling consequence: women were the farmers among them, despite a society even **more** male-oriented than the Taínos' own.

A St. John petroglyph.

A curious ambivalent development in the Carib world, then, was that even though young brides must move from their kin and settle with their husband **if he were a war-chief,** in all other instances the young grooms moved to the houses of their brides' kin: boys being much easier to move about than cornfields! Another curious development is the presence of outright slavery among the Caribs—the Taínos never passed the bounds of serfdom to plain servitude except when captured by their enemies the Caribs.

Here, in brief, are the agricultural systems of the aborigines of the West Indies. We may still learn much from them, and we still do not understand all there is to them. To the archaeologist and to the historian belongs the happy task!

Prize-Winning Food Fair Cooks

By Ruth Lang
Department of Agriculture

Every year the islands' top cooks are busy for weeks preceding the fair as they get their utensils and ingredients ready for the judging at the annual Agriculture and Food Fair in February.

Chosen by the V.I. Department of Agriculture are three judges who are selected for their knowledge and expertise in the art of local cooking. Generally judges include two women and one man, and attempts are made to change the judges each year.

Fair officials Pholconah Edwards and Elaine Xaviar assist Judge Emelda Allick tabulate results in annual food fair contest for islands' best cooks.

Judging by numbers assigned to food items takes place every day of the fair from noon on throughout the afternoon in a special secluded room in the Food Building at the fair. Judges do not know the names of the entrants. Participants are allowed unlimited entries for each food unit category and items are judged carefully for flavor, consistency, aroma and eye appeal. The food which is submitted for judging actually becomes the property of the food fair management, and the prize winning dishes must remain on display throughout the day, except for the Best Decorated Cake, which is judged on Sunday.

Choosing the top prize winners is not always easy because the cooks have exerted their energy and best efforts to produce the finest mouthwatering dish they can make. Each year different entries take prizes but most cooks come back every year to compete, win or lose. As many judges have observed, each entry reflects its own distinctive quality.

There are five categories for food booths in the fair building: native and old fashioned (heritage) foods; cakes, tarts, pies, breads, candies and ice cream; condiments; preserves, jams and jellies; local fruit and vegetable juices and beverages (non-carbonated). In addition, prizes are also given for the best decorated table and a special prize is offered for the best original main dish using locally grown vegetables in season at the time of the fair.

In recent years, singing groups from St. Luke's Church have taken many blue ribbons and everyone remembers with fond nostalgia the fine dishes made by the late Rebecca George who displayed her art of cooking at the fair each year. Top winners in 1981 were Delores Hansen, Gladys Griffith, Louise Samuel, Gwendolyn Fludd, Alma Doward, Fedelia Harrigan, St. Luke's Gospel and Junior Choirs. and Alice Schuster.

SOME 1981 WINNING RECIPES

Marbi (Maubi)

by Delores Hansen

1 bunch sweet marjoram	4-5 sticks maubi bark
1 bunch rosemary	1 inch white root
1 bunch anise	1 dried orange peel
¼ lb. ginger	1½ gal. water

Boil the above the day before you are ready to use it. Later that night, strain, then add 1½ gal. of water to strained contents, stir and toss up and down a few times and sweeten to taste. Get a bottle of stale maubi or 4 tsp. of yeast then bottle it out and leave it to work overnight.

Sweet Potato Pudding

by Gwendolyne Fludd

1 lb. sweet potato (grated)	1 tbsp. cinnamon
1 lb. pumpkin (grated)	1 tbsp. mace
1 lb. tannia (grated)	1 tbsp. nutmeg
1 coconut (grated)	1 tbsp. black pepper
1 lb. sugar - brown or white	
¼ cup Crisco or shortening	

Start by pealing potatoes, pumpkin, and tannia. Wash and grate. After these ingredients are grated, add your spice and mix well, then pour in melted shortening. Place in a greased baking pan and bake at 300° F for about 1½ hrs. You could also add a piece of fat pork. Cooking is done very slowly. Test to see if done by inserting a knife. If knife comes out clean then pudding is done.

Jaw Bone Candies
by Fedelia Harrigan

1 tbsp. peppermint oil
5 lbs. sugar
6 pt. water

Bring sugar, peppermint and water to boil. Boil until it reaches 250° F. Then take boiled mix, pour it on a marble stone and roll for about 15 minutes. Nail a 6" nail into a piece of lumber about your height. Take rolled mix from marble stone and hang it on the nail. Pull mix on nail causing it to go around into a circle for about 15 minutes or until mix becomes very smooth. Remove from nail and return to marble stone where it is cut into pieces. Makes 1½ dozen.

Vienna Cake
by Louise Samuel

1 cup butter
2 cups sugar
4 to 6 eggs
4 cups flour
3 tsp. baking powder
1½ cup milk
1 tsp. vanilla essence
1 tsp. almond essence
4 or 5 preserves including chopped guavaberry and lime.

Cream butter, add sugar gradually still creaming about 15 minutes. Add eggs, one at a time until light. Sift flour and baking powder and add little at a time with milk & essence while folding.
Grease 3 layer cake pans and bake in oven 350° F approx. 20 to 25 minutes. Let cool. Preferable to bake a day before. Slice each layer into two using 4 or 5 flavors of preserve, preferably local green lime, guavaberry, guava jelly or jam, pineapple preserve. Mix each preserve with rum or brandy. Put a layer of preserve between each layer and sprinkle lightly with liquor. Ice cake.

Quick Kalaloo
by Louise Samuel

Approx. 3 fish
½ lb. ham or ham bone and skin
3 pig tails
3 lbs. okra (chopped or ground)
kalaloo bush (chopped)
2 crabs or crab meat
3 conch
½ lb. salt beef
4 lbs. spinach (chopped)
3 quarts water

Soak meat overnight. Fry fish and have it boned. Wash crabs well, set aside. Cook meat and conch until almost tender. Add chopped okra, kalaloo bush and crabs. Let cook for about 30 minutes while skimming occasionally. Add frozen chopped spinach and fish. Let cook for another 10 minutes. Add hot pepper to taste and let simmer.

Roast Pork Gravy
by Alice Schuster

Add hot water in the pan the pork was roasted in, set aside. Brown 1 pot spoon of flour in some oil, add onion, sweet peppers, celery, garlic (crushed) in the browning flour and cook all up a little. Add some tomato sauce then

St. Lukes Choir has taken top prizes for their entries in recent years at the fair.

the hot drippings from the pan that the pork was roasted in, and keep stirring as you throw in the water. Add some thyme, and 4 whole cloves. Let it all cook about 10 minutes, taste for salt, and add what is needed.

Congratulations from food exhibits director Ruth Lang (left) go to Louise Samuel for her Vienna Cake and other prizes as Mary Henderson (center), her assistant, smiles happily.

Red Grout

by Alice Schuster

8 cups water
24 guavas, cut-up
4 oz. tapioca (½ box)
Sweeten to taste
Juice from 1 lime

Boil guava in 8 cups of water for 2 hrs. Strain and taste for a tang, if none add the juice of 1 lime. Put back on fire and when water comes to a rolling boil sprinkle in the 4 oz. of tapioca. Keep stirring (it lumps very quickly), sweeten to taste. Remove from fire and let cool for ½ hour, stirring now & then. Add ½ tsp. of red food coloring, mix in slowly. If it does not color enough add a little more. Do not overcook, 8 to 10 minutes is enough.

Cream:

2 cans evap. milk
3 egg yolks
2 cans water
1 tbsp. cornstarch

Mix out egg yolk with some of the liquid. Then sweeten to taste, add 1 heaping tbsp. of conrstarch to mixture. Cook over boiling water until slightly thickened, remove from fire, add vanilla flavor.

Watermelon Jelly

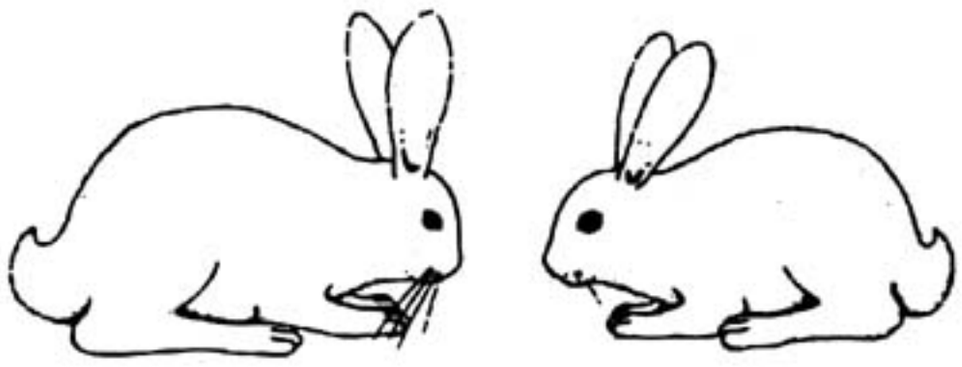
Jocelyn Dowdye
Beulah Thompson
St. Luke Senior Choir

4 cups watermelon juice
7½ cups sugar
¼ cup lime juice
6 oz. fruit pectin

Pour watermelon juice and lime juice into a large saucepan, add sugar. Mix well. Place saucepan over high heat and bring to a boil, stirring constantly. Bring to a rolling boil. At once stir in fruit pectin. Then to a full rolling boil and boil hard 1 minute stirring constantly. Remove from heat, skim off foam with metal spoon, and pour into clean glass jars.

Island Hopping with 4-H - Do Rabbits Have a Future in the Virgin Islands?

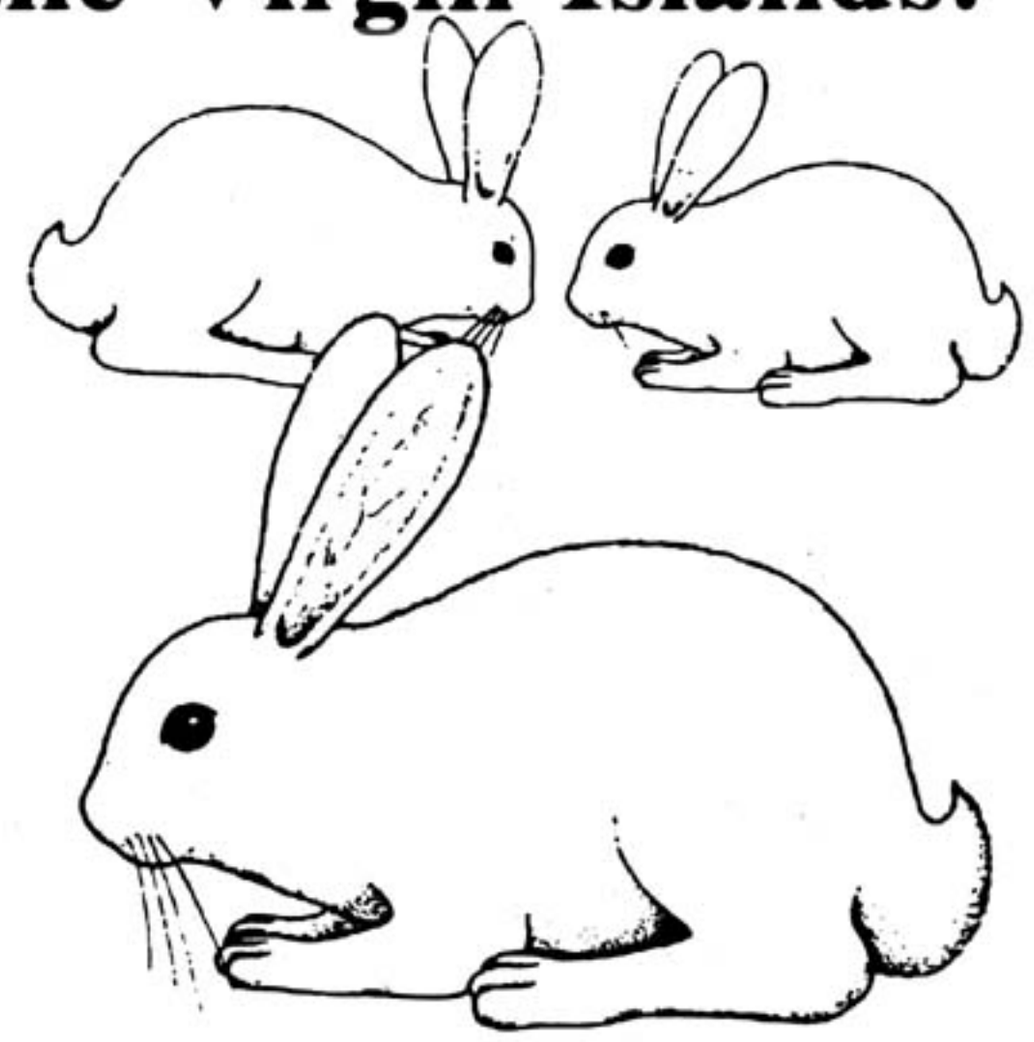
By Alan S. Oliver and Charles Smith
C.V.I. Cooperative Extension Service

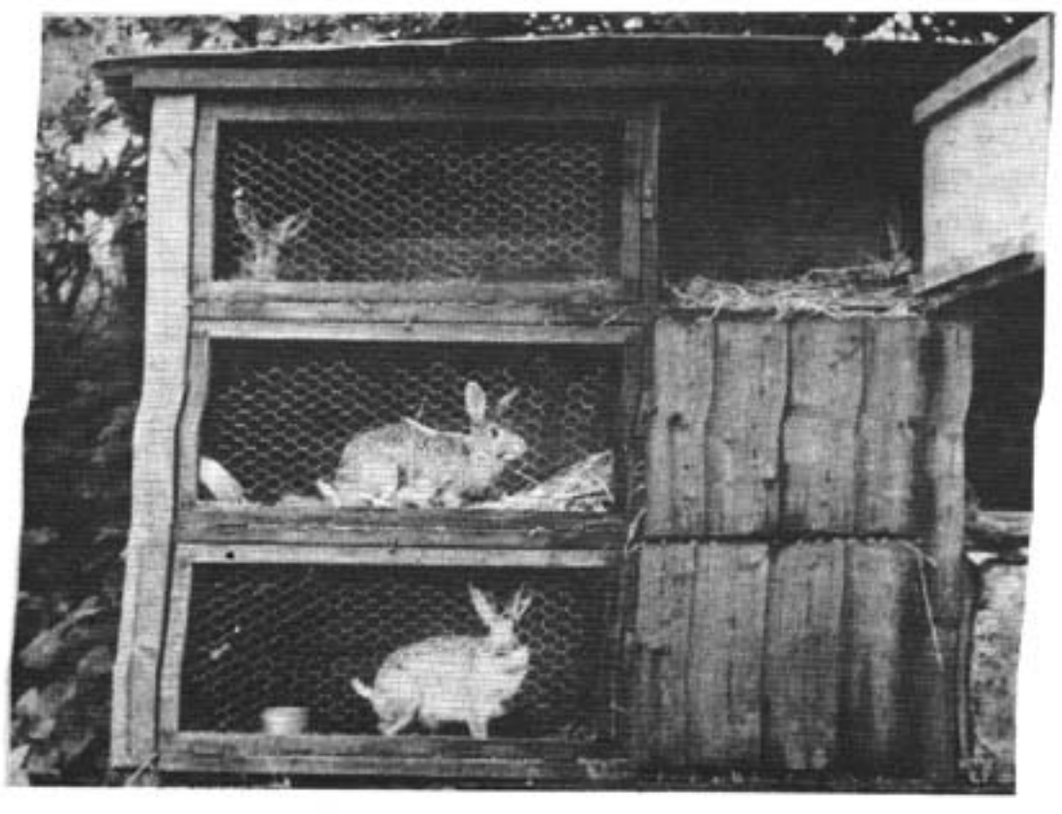


We most often think of rabbits in northern woodland landscapes or as a favorite image at Easter. Rabbits are always cute and lovable as we are told in the cartoons and mostly suitable as pets for our children.

New information is now available that will increasingly put the rabbit under a banana tree as well as under an oak tree. Ghana, a nation in West Africa, has started a nationwide rabbit raising project to increase the supply of protein in people's diets. Belize, in Central America, and the Dominican Republic are cooperating with Michigan State's Extension Service to increase rabbit production. Many other islands in the Caribbean, such as St. Kitts, are encouraging people to try their hand at raising rabbits. It is in the French speaking islands of the Caribbean and in France and Belgium that rabbit is considered a welcome addition to the regular diet.

4-H is interested in rabbits as a way to involve more youth in a productive animal husbandry experience. Often the space is not available for a calf, horse or even a goat but very little space is needed for a couple of rabbit hutches. Raising a few rabbits is a worthwhile experience because youth learn responsibility through caring for an animal. 4-H is very concerned with the practical side of life. Can the food budget be extended by raising your own meat? Can we help families be more self sufficient? How can we teach youth to earn money through their own business or by forming a cooperative? 4-H is interested in the rabbit because it is a small scale animal which takes up little space, is cheaper to feed than chickens but can provide the family with food or be offered for sale after about eight weeks of growth. A 4 to 5 pound rabbit can be produced in the same amount of time as a 4 to 5 pound chicken. It eats about 18 ounces of food daily, and feeds naturally on grass, shrubs and green shoots because it is an herbivore (plant eater).





A simple rabbit hutch bedded with straw will serve as a shelter from weather and predators, and is easy to construct.

Food crops which can be grown in the back yard garden for a family household and at the same time feed some rabbits for home use are, carrot, cabbage, lettuce, beet, chicory and sunflower. All of the above vegetables plus peas and beans grow well in the Virgin Islands. Local grasses like "french weed", better known as water grass to some people, are also good for feeding. Rabbit manure, in addition, could be of very good use to a small back yard garden.

Do rabbits have a future in the Virgin Islands? There are people here who are already raising rabbits which indicates they can be raised productively here. However, the question might also be a cultural one. Will Virgin Islanders change their eating habits to include rabbit meat in their meals? Educational efforts will be crucial to

the success of a rabbit project. The large food and drink companies are constantly changing food habits through advertising and public relations campaigns, so it can be done. Chicken legs will never be replaced, but some delicious home grown rabbit legs, raised by your son or daughter who is proud of contributing to the family food supply, could be part of our culinary future here in the Virgin Islands.

When starting rabbit production you should treat it as a business and learn some elements of business management. Your children will need to find the initial capital to invest in their hutches, breeding stock and feed. Where will they get it? If they earn it, fine; but borrowing is also a part of good business and by borrowing they could start a larger project. They should pay interest on the borrowed money, just as other businesses and farmers do.

Building the hutch will require young people to learn some carpentry skills. The minimum dimensions for rabbit hutches should be 3½ feet long by 2½ feet wide by 2 feet high, and home hutches could be constructed without much trouble. Regular wooden boxes with ¾" mesh wire in front make an easily constructed hutch.

Two does and a buck or access to a buck will be enough breeding stock to start with. Each doe will require about 20 square feet of yard space. 4-H will be offering workshops in March and April for those who want to learn how to start their own rabbit project. The important decision to make is whether you want to raise rabbits as a pet or raise them for food production. The latter requires you to face the reality of killing your animal for meat production at the appropriate time. Someone has already done that for you when you buy those neatly packaged meats at the supermarket.

This year the 4-H Program will begin experimenting with the rabbit project and rabbit recipes to see if the rabbit can become more than just a fictional visitor at Easter and can contribute to the basic food supply in the Virgin Islands. If you have any questions about rabbits or you are interested in helping us involve youth in rabbit production, contact the 4-H office at 778-0246.

Why Agriculture Quarantine

By Roy Cole
USDA, APHIS, PPQ

For those who may be unaware, travelers entering any part of the United States of America from a foreign port are required to pass through an agriculture inspection just the same as Customs and Immigration inspections. Usually the agricultural check is an integral part of the Customs Inspection and many travelers are scarcely aware that they are being checked for the Department of Agriculture also. Obviously, close cooperation with U.S. Customs is required. The agency responsible for this in the U.S.D.A. is the Animal and Plant Health Inspection Service, Plant Protection and Quarantine Programs (APHIS, PPQ). There is an Officer in Charge with a staff of plant protection and quarantine officers on both St. Croix and St. Thomas who are charged with the responsibility of enforcing federal quarantines to prevent the introduction of additional pests. The regulation of plant and animal pests occuring on the mainland is accomplished with domestic and state quarantines that prohibit movement of given pests from areas of known infestation to uninfested areas.

Recent outbreaks of Mediterrean fruit flies **(Ceratitis capitata Wiedeman)** in California and Florida point up the importance of maintaining an effective barrier to exclude additional plant and animal pests from entering the Virgin Islands. The more plant and animal pests we have, the more our food and livestock production are reduced. The exclusion of pests is accomplished by promulgating quarantines on specific pests or hosts.

Consider for a moment the fragile food production programs that currently exist in the Virgin Islands. It doesn't take much imagination to visualize the loss in food production that would occur in the event a pest not established here found its way into the papaya fruit so common on the islands. The papaya fruit would be destroyed and thus create a shortage of one of the food items grown and consumed here. The same applies to the poultry being grown in the Virgin Islands. An unsuspecting traveler could return to his home here bringing a piece of chicken or fresh eggs carrying New Castle Disease. The result could be death to the local chicken business and increased poultry and egg shipments from the mainland. Another example is a traveler visiting from down island and deciding to conceal a piece of fresh pork he is carrying in hopes the customs officer won't find it. If the meat goes undetected, the result could be the introduction of Hog Cholera into the pig population and the attendant loss of pork and pork products. Obviously hog cholera is no bonus in the production of pork. From these examples you can see that the introduction of additional pests will further weaken Department of Agriculture and Cooperative Extension Service efforts to bolster food production locally.

It has been calculated that in 1975, the citrus industry alone was a business of $1,391,000,000 in the United States. Assume for a moment that only 10% of the crop had been destroyed by invading foreign plant pests. That would amount to a dollar loss of $13,910,000, a substantial loss any way you look at it. Reliable estimates for the year 1978 place the total loss of crops in the United States due to pests as $30.8 billion for that year alone. That's mind boggling, to say the least.

Another aspect of the foreign pest problem is the case of the sugarcane root borer, **Diaprepes abbreviatus,** originally feeding on the roots of the sugarcane plant. With sugarcane production almost a thing of the past, now we find the adults feeding on citrus plant leaves and the flowers of the yellow candle **(Cassia alata).** So even without sugarcane production we are still plagued with the root borer larvae feeding on the roots of other plants, including avocado and croton.

Looking at the quarantine problem from the other side of the coin, there are plant pests that are established here in the Virgin Islands but are not found on the mainland. For this reason we have what is known as 'territorial quarantines' that prohibit the movement of certain pests and host material to the U.S. mainland. One example of this is the West Indian Fruit Fly, **Anastrepha obliqua,** that feeds in mangoes. An examination of the exterior of the mango does not reveal the presence of the larvae feeding under the skin. Consequently, there is no way of knowing if a particular mango is a potential carrier of the fruit fly unless the fruit is completely dissected and examined. Therefore, to help prevent the spread of the West Indian Fruit Fly to the U.S. mainland, a ban is placed on the movement of mangoes and other host material that could carry it to the mainland.

I'm sure you will agree that we have enough animal and plant pests already and are wise to do all we can to exclude additional pests from the country. So, the next time you are being checked in Customs and the Inspector asks if you are carrying any fruits, plants, or meats, he is not hassling you but rather helping to protect your food supply. Careful attention to the Customs Declaration Form will reveal that there are two questions that deal with agriculture The first asks if you are carrying fruits, plants, meats, or other agricultural material. The second question asks if you have been on a farm in the past thirty days. Your answers to these questions helps the Customs Officer with his examination. Often he will summon one of the PPQ Officers to examine the plant material or animal products. In the case of travelers who have been on a farm, the individuals' shoes will be examined more thoroughly to be sure they are not contaminated with

mud or farm manure. By questioning the traveler as to the exact origin of plant material and countries he may have traveled in, the PPQ Officer can use his expertise to assess the situation and make a determination as to whether or not to permit the traveler to enter with the material or to seize it. Remember, the only alternative is the use of pesticides, which is expensive, and may pollute the environment.

Following are some items that may be moved to the mainland after examination to verify that they are free of plant pests and soil:

> Avocado, Banana, Ginger, Dasheen, Pepper, Pineapple, Plantain, Lime & House plants free of soil.

The following are prohibited movement to the mainland:

> Caetus plant, Guava fruit, Mangoes, Soursop, Sugarapples, Sugarcane, and Plants in soil.

For information regarding fruits and plants, contact one of the offices in St. Croix or St. Thomas. Each country is treated individually as to what can be imported and a general statement cannot be made as to what can be imported from all countries and what is prohibited from all countries. The telephone number for the St. Croix office is 778-1696 or in St. Thomas the numbers are 774-2787, 774-2561, or 774-5719.

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