

1983-1984 REPORT

Agricultural
Experiment
Station

Achievements

Cooperative
Extension
Service



COLLEGE OF THE VIRGIN ISLANDS

1983-1984 Report
of
College of the Virgin Islands
Land Grant Programs

AGRICULTURAL EXPERIMENT STATION

COOPERATIVE EXTENSION SERVICE

October 1985

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Editor
Liz Wilson

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Issued in furtherance of Cooperative Extension work, acts of Congress May 8 and June 30, 1914 (as amended), in cooperation with the U.S. Department of Agriculture, D.S. Padda, Director, College of the Virgin Islands Cooperative Extension Service. The College of the Virgin Islands Cooperative Extension Service is an Equal Opportunity/Affirmative Action organization, providing educational services in the fields of agriculture, home economics, rural development, 4-H youth development and related subjects to all persons regardless of race, color, religion, sex or national origin.

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Land-Grant Director Darshan S. Padda received Distinguished Service Award from U.S. Department of Agriculture secretary John R. Block (left) in May 1983.



FROM THE DIRECTOR

This report covers research and educational activities carried out by the Agricultural Experiment Station and the Cooperative Extension Service respectively for the period covering 1983 and 1984. Both agencies have expanded their programs and activities during this period of report and have successfully attained their mission of serving the people of the Virgin Islands.

Both partners in the Land Grant System have carried out their commitments in supporting the work of the research and extension staffs who are dedicated to develop and transfer locally relevant food and agricultural technology. The federal partner—the U.S. Department of Agriculture—provided financial assistance and program support in an understanding and satisfactory manner. The local partner—the College of the Virgin Islands under the leadership of President Richards—has played a pivotal role in turning Land Grant programs into a Virgin Islands success story as these programs have received unprecedented acceptance from the people of these islands. Mention should be made here also of the supporting role of the college Board of Trustees who, through their keen interest in our work, have boosted our spirits and have provided encouragement at all times.

During this reporting period, establishing and upgrading of home economics, pest diagnostic service and management, and soil and water testing laboratories, have greatly enhanced the capability of Land Grant programs to provide much needed professional services not only to the Virgin Islands' residents but to the entire eastern Caribbean region. The Land Grant programs also played a most significant role in helping establish an Eastern Caribbean Center at the College of the Virgin Islands. Under the auspices of this center, proceedings of the Annual Meeting of the Caribbean Food Crops Society held in October 1984 on St. Croix are being published and disseminated to the larger agricultural community in the Caribbean. This 5-day meeting was the best attended in the 20 year history of the Society, bringing together hundreds of agricultural scientists from the region and the mainland.

The addition of a Natural Resources Program at the Cooperative Extension Service has added yet another dimension to our community outreach work. Active educational programs in the areas of agriculture, home economics, 4-H youth development, and community resource development have reached thousands of Virgin Islands residents with research based information to help improve the quality of life for each individual. And to guarantee this continuous flow of locally relevant research information the scientists at the Agricultural Experiment Station have worked with great zeal on projects in animal science, aquaculture, agronomy, vegetable crops, fruits, irrigation technology, plant pathology, and entomology.

I hope the information contained in the report will give added insight to readers on the roles of both the experiment station and extension service and will help Virgin Islanders to become better gardeners, farmers, homemakers, community leaders and citizens.



D. S. Padda

Darshan S. Padda
Director,
Land-Grant Programs



Dr. Darshan S. Padda, Director
Agricultural Experiment Station
College of the Virgin Islands

Cordially invites you, to attend
The Official Dedication Ceremonies
of the
Aquaculture Research Facility
Melvin H. Evans Center for Learning,
St. Croix Campus
on
Saturday, June 11, 1983

Please RSVP to
Liz Wilson - - 8-0246

4:00 o'clock p.m.

*Facility located east of the main St. Croix Campus
via Annex building road.*

Agricultural Experiment Station

The Agricultural Experiment Station serves as a small yet effective research station with projects concentrating mostly in aquaculture, animal science, agronomy, horticulture, irrigation technology, pest management and plant pathology. During the period of 1983 and 1984 the main spectrum of emphasis was on research in the production of animal feed for livestock and poultry, with field experiments conducted on grain and forage crops useful to the local farmer; evaluation of Senepol Cattle under Virgin Islands' conditions and characterization of the Senepol breed utilizing computers for ready access to information; evaluation of culturing methods for freshwater tilapia fish that can be adapted for home production in the Virgin Islands; determining the best fruit and vegetable varieties and production practices for island climate conditions, focusing on trials of food crop varieties which withstand heat and drought as well as the myriad of destructive tropical pests and diseases encountered in the islands. Although not purely educational in nature, the Agricultural Experiment Station does conduct field days and tours as well as having direct contact with local producers. Scientists work closely with outreach staff in the Cooperative Extension Service to augment their assistance to local residents.

FISH CULTURE SYSTEMS

A major event of 1983 was the official dedication of the aquaculture research facility. Members of the community, college officials, faculty and staff, as well as representatives of the Virgin Islands government, toured the new facility for a first hand look at the tilapia hatchery and the six new fish culture/hydroponic systems. These new recirculating systems were constructed to study the intensive culture of freshwater tilapia and explore the feasibility of integrating hydroponic vegetable culture into the freshwater treatment process.

Research Facility The systems consist of a 3000-gallon rearing tank, a 500-gallon sludge settling tank, a 375-gallon reservoir and two hydroponic biofilters consisting of shallow tanks of crushed gravel with a total surface area of 152 ft². The total water

volume of each system is approximately 4000 gallons.

In a preliminary trial one of the systems was stocked with 5000 tilapia fingerlings weighing a total of 59 pounds. Five months later their total weight had increased to 522 pounds and the carrying capacity of the system had not yet been reached. Following the trial, an experiment was initiated to determine the carrying capacity of the system, to measure the concentrations of nutrients found in fish wastewater which are important to plant culture, and to evaluate the production of six tomato varieties under three nutrient treatments.

Each system was stocked with 1200 fingerlings (*Tilapia aurea*) averaging 132 lb in total weight. After 6 months of growth, an average of 873 lb of fish were harvested per system with a survival rate of 97.6%. The average feed

conversion ratio (total feed weight divided by fish weight gain) was 1.67. The main factor limiting production was the buildup of ammonia, which resulted from biofilter clogging.

Tomato production was low, less than 2 lb per plant, due to ammonia toxicity, insect infestation and vascular tissue damage at the base of the stems which were cut by the sharp edges of the gravel as wind rotated the plants. Insects were brought under control by acephate, a systemic insecticide that is relatively non-toxic to fish.

Experiment Results Generally low tomato production obscured variety and treatment differences, but some observations were made. The concentrations of calcium, magnesium, nitrate, and most of the micro-nutrients that were generated from fish feed appeared to be adequate for



Aquaculture Specialist Ayappan Nair points to lush tomato growth in hydroponic/fish culture backyard system constructed with oil drums.



John Hargreaves, aquaculture research technician, stocks a culture tank.

optimum plant growth. The levels of iron were low and supplementation with a chelated iron compound was required. The results also indicate that the plants may benefit from the addition of potassium, phosphorus and sulfur. The buildup of nutrient salts to toxic levels is a potential problem in closed systems.

Analysis While an economic analysis of the system has not been completed, initial results suggest that it may be profitable. The major expenses for feed and electricity amount to \$1.19 to produce a pound of fish which can be sold for \$2.00/lb or more.

Several modifications were made to the systems to correct problems that occurred during the experiment. The major changes were the installation of false bottoms in the hydroponic tanks to prevent clogging, the replacement of vinyl liners in the rearing tank with

more durable hypalon liners and the addition of air lines in the rearing tanks as a backup to the agitators.

Second Experiment An experiment was then conducted to evaluate the growth of four varieties of tomatoes and 12 varieties of green leafy vegetables. Each system was stocked with 1000 tilapia fingerlings averaging 70 pounds in total weight. After 165 feeding days, an average of 727 pounds of fish were harvested per system, with a survival rate of 96.4%. The average feed conversion ratio was 1.52. Water and electrical requirements were 10.5 gallons and 3.7 kWh per pound of production. The bio-filters did not clog, but the buildup of ammonia continued to limit feeding and production.

Modifications to the system improved operations but a new problem developed. Herbicides applied to the soil beneath the hypalon liners to pre-

vent nutsedge from growing through the liners proved to be toxic for the vegetables (but not the fish) by apparently volatilizing through the liners into the culture water. Work continues on this project with an affirmative outlook.

Cage Culture Feeding Methods I

An experiment to evaluate feeding methods for cage culture of tilapia was completed. The fish were stocked at a rate of 400 fish in cubic meter cages and fed for 20 weeks. The treatments consisted of manual feeding twice daily seven days a week and demand feeding, which allowed the fish to feed themselves. The fish triggered the release of feed from a bucket, which can hold 13.2 lb of feed, by hitting a rod suspended in the water. Demand feeding produced a higher net yield (301 lb compared to 261 lb for manual feeding) and a significantly lower feed conversion ratio (1.48 compared to



Building additional new fish culture tanks.



Completed tanks with hydroponic beds to the left.

2.05). The demand feeders were re-filled an average of 34 times compared to 285 manual feedings, which is equivalent to an 88% reduction in labor with the use of demand feeders. The estimated annual profit from cages with demand feeders is \$650 compared to \$177 for cages fed manually.

Cage Culture Feeding Methods II

Another experiment was conducted to evaluate demand and manual feeding at stocking rates of 200, 300 and 400 fish per cubic meter in a 2.5 acre pond and 300 fish per cubic meter in a 0.25 acre pond. In the large pond, demand fed fish had a lower production (147 lb) than manually fed fish (183 lb) and a lower feed conversion ratio (1.94 compared to 2.48). In the small pond, demand fed fish also had lower total production (158 lb) than manually fed fish (249 lb) and a lower feed conversion ratio (2.03 compared to 2.23). There was no conclusive result as to the most productive stocking density because a tropical storm caused considerable mortality that varied among the three stocking rates. The fish were fed for 28 weeks and growth rates were low due to low water temperatures. Although manual feeding was more productive in this study, demand feeding resulted in better feed conversion ratios and an average labor reduction of 93%. Demand feeding was approximately 12 times more productive per unit of labor than manual feeding.

Rain Catchment A rainwater catchment system was established to provide a supply of rainwater for the fish culture-hydroponic experiments since well water in the Virgin Islands is often too high in salt content for hydroponic culture. A nylon-reinforced vinyl tarpaulin 100 feet by 200 feet with a surface area of nearly one-half acre was installed on a gentle slope (3%) south of the research facility. Rainwater is re-



Freshman senators of the 15th legislature visited aquaculture facility. They included Cleone Creque Maynard, Lorraine Berry, Adelbert Bryan and Virdin Brown.



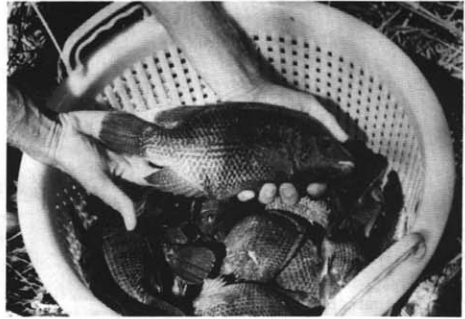
A rainwater catchment to collect and store rainwater from a 100 X 200 foot tarp can collect more than 400,000 gallons of rainwater annually.



A tranquil view of cage culture in local pond with automatic feeder on top of cage.



Fish sales are held periodically to introduce full grown tilapia to the public and provide funds for equipment.



Full grown tilapia average weight is over a pound.

tained by small dikes at the lower portion of the tarp. As it flows into a four-inch pipe leading to a 3000 gallon sump it is then pumped to a 17,000 gallon above-ground storage tank equipped with a floating cover to prevent evaporative loss. When the storage tank is full, the sump and catchment provide 19,800 gallons of additional storage capacity.

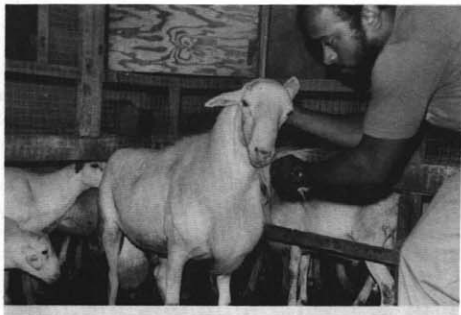
The catchment system, including the storage tank, cost \$19,800 to construct in 1983. Based on an average rainfall of 44 inches, the system should collect 442,000 gallons of rainwater annually, valued at \$13,260. The pay-back period for the system is approximately 1.5 years.

Tilapia Pond Culture Two demonstrations of tilapia pond culture were completed in a ¼-acre pond at the Golden Grove Correctional Facility not far from the college campus. Under the direction of aquaculture program personnel, prison staff and inmates have been involved in learning about the rearing of tilapia. After an initial 20-week production period, 1,098 pounds of tilapia were harvested. Average weight per fish was 0.61 pounds and survival was 86.0%. The feed conversion ratio of 2.45 was much higher than expected because overfeeding early in the demonstration caused a deterioration of water quality.

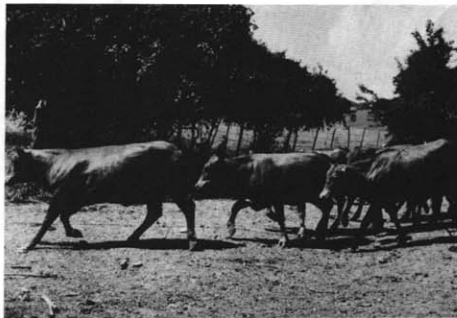
The pond was later restocked with

2000 tilapia fingerlings that had been sex-reversed using the hormone 17 α -methyltestosterone. After a 26 week production period, the pond yielded only 618 pounds of marketable fish and more than 700 pounds of fingerlings. Excessive reproduction was the result of accidental mixing of the male sex-reversed fingerlings with normal female fingerlings.

Experimental production of tilapia amounted to 4400 pounds in 1983 and increased to 5600 pounds in 1984. Most of the fish were sold to the public to generate interest in the fish culture and to provide funds for the aquaculture program.



White-hair sheep in quarantine prior to shipment from St. Croix to WINROCK in Trinidad and Tobago. Note long, silky, rather than woolly, hair of the breed developed for hot climates.



Young Senepol cattle heading back to pasture after tick dipping and weighing at Lawaetz' farm.

ANIMAL SCIENCE ON THE FARM

The Senepol Breed The Agricultural Experiment Station animal science program works very closely with the local cattle breeder and dairyman since the college does not maintain its own experimental herd. While some cattle are raised on St. Thomas, the main commercial livestock operations occur on St. Croix where a large cooperative dairy is in operation and several growers have large herds of Senepol cattle. The latter are used for beef as well as providing breeding stock which are shipped off-island to the United States, South America and other Caribbean islands. Developed to meet the specific requirements of the tropical Caribbean climate, the Senepol cattle breed was started in the early 1900's by crossbreeding Red Poll and N'Dama cattle. The characteristics of both breeds have combined in the Senepol to produce an animal with heat tolerance and insect resistance which is extremely gentle, has good meat and high milk production. Called Cruzan Breed, St. Croix Cattle or Nelthropp Cattle (the latter after early Crucian Senepol developer Bromley Nelthropp), the Senepol trademark was registered in the United States in 1954 as "St. Croix

Senepol" and the Virgin Islands Senepol Association of St. Croix was chartered in 1976.

Evaluation of Senepol In general, the emphasis of the Animal Science research program has continued to be evaluation of Senepol cattle under Virgin Islands conditions. Data were collected and processed on eight V.I. cooperators and four stateside cooperators for the on-the-farm Senepol Performance Testing Program. Emphasis was placed on keeping existing records up to date, with 30,000 edited and nearly 25,000 records in the process of being entered for analysis of the pre-foundation (prior to 1977) farm data. Technical information and assistance were given to the V.I. Senepol Association (VISA) concerning performance testing, data management and promotion. This included assistance to beef producers in the selection of superior breeding stock and in the development of comprehensive breeding plans. And, more specifically, in aiding the development of a Senepol Sire and Dam summary to indicate superior animals. Cooperating cattle raisers were assisted in the selection of breeding stock for their own herds and

for export. Also a comprehensive collection of blood (for type) was made from bulls to be used for breeding or export.

Computer Help The performance test program has been greatly enhanced by the acquisition of the research program's new computer system. The program was maintained by regular visits to 12 V.I. Senepol cooperators and by processing data of 12 off-island cooperators, thus expanding the data base on Senepol across numerous environments.

White Hair Sheep In 1983 Westview Press (Boulder, Colorado) published a book entitled *Hair Sheep of Western Africa and the Americas* which featured one segment entitled "Virgin Islands White Hair Sheep," co-authored by Dr. Harold Hupp, the experiment station animal scientist and Dr. Duke Deller, V.I. Department of Agriculture veterinarian. The animal science program collaborated also with Winrock International Sheep Research Station on Tobago, by assisting in securing representative samples of the Virgin Islands White Hair Sheep for the Winrock evaluation program which is almost completed.

FEEDING OUR LIVESTOCK

The agronomy program has continued to concentrate its investigative efforts on the identification of appropriate feed crops for the livestock industry. The main areas of interest have been sorghum (for grain, hay, silage and grazing), forage legumes and tropical grasses. In St. Croix, forage provides most of the feed units consumed by ruminant livestock. The occurrence of wet and dry seasons leads to abundant forage during the rainy seasons but acute shortages during the dry season. Sorghum, millet, grasses and legumes offer a real solution to the feed shortage in the Virgin Islands during both the wet and dry seasons.

Recognizing the limitation of St. Croix soil, climate and other crop production factors, agronomy research has continued an intensive study of animal feed crops which focuses on the production and management aspects of these crops. Grain crops included both commercial and non-commercial sorghum and millet trials. Tropical forages were the other basic area of forage production and utilization.

Commercial Grain Sorghum Trials

In trials of commercial sorghum for grain production and evaluation studies it was revealed that Pioneer 821W was the highest grain yielder (8997 kg/ha) and had the lowest percentage of bird damage over all other varieties. The application of 80 kg of nitrogen, 20 kg phosphorus, 20 kg potassium, and 1.0 kg minor elements mixed per hectare resulted in an increase of grain yield by 39% in comparison to non-fertilized plots. Dry matter yield results showed that Pioneer varieties produced the highest mean average dry matter of 6,917 kg oven dried forage per hectare followed by Garrison varieties (5409 kg/ha) and Taylor varieties (4486 kg/ha). The mean average bird damage percent was

approximately the same for both Pioneer and Taylor (T-E) varieties (approximately 7%) followed by Garrison varieties (14%). The fungicide Bravo was effective in reducing the number of heads infested with smut. However, sorghum trials have been conducted on the same land for a number of years. Consequently, rotation will be practiced to determine its influence on disease incidence. Sorghum midge control was obtained by application of Sevin, Dipel and Lannate.

Forage Sorghum Pioneer 988 cultivar of commercial forage sorghum was the top green producer with 45,062 kg/ha/yr and also the best dry yield producer with 13,892 kg/ha/yr. Silomaker cultivar, however, has the advantage of more prolific grain and leaves in comparison with all varieties in the studies.

Results of studies of non-commercial forage sorghum revealed that forage yield (both green and oven-dried) of PR 5 PR cultivar was higher than all commercial varieties in terms of overall production. PR 5 PR produced 8,469 kg/ha/yr of grain in addition to

its forage yield. As expected, wet season planting (September-December) gave a higher yield than planting in the dry season (January-July).

Millet Research Two experiments on the introduction and evaluation of millet (*Pennisetum americanum*) for grain and forage production were initiated on November 11, 1982 and April 13, 1983. The varieties used in these studies were Ghali 3 hybrid pearl millet, Red Millet, Canary seed, White Millet, Ghali pearl millet, and Ghali pearl millet certified. Experimental design, row arrangement, weed control and pest control procedures were very similar to sorghum for forage investigation. Grain yield was harvested weekly for a period of four weeks because the plants reached full bloom at different times and bird damage was severe on the mature seed heads. Ghali 3 hybrid pearl millet was the largest producer with 4320 kg/ha of grain. Next highest yield was obtained from White millet with 4,231 kg/ha. Based on data taken, it is recommended that millet should be planted in the rainy season for one or two crops because



Field measured and staked in preparation for grain and forage sorghum trials of 40 commercial varieties.



Siratro (*Macroptilium atropurpureum*) appears to be one of the promising tropical legumes adapted to St. Croix.



Research agronomist Ahmed Hegab observes abundant sorghum seed head.

grain and forage yield decline significantly after the first harvest.

Forage Grasses On St. Croix, forage grasses and legumes provide most of the feed units consumed by ruminant animals. Research by the agronomy program is directed towards introducing and selecting forage plants which will have good yields, high nutritive quality, seasonal distribution and adaptability to climate and soil conditions on the island. One of the most suitable forage grasses appears to be Green Panic (*Panicum maximum* var. *trichoglume*) with the highest yield of

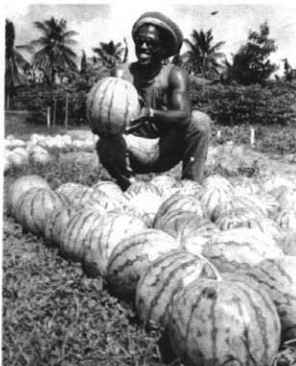
14,488 kg dry forage/ha/yr. Not only does Green Panic yield the most but it seems to adjust well to extreme water stress conditions. Farmers attest to its increasing popularity in the eastern sector of St. Croix where the rainfall is scarce. Buffel grass (*Cenchrus ciliaris*) was the second highest with 9,560 kg/ha/yr. Both of these grasses adjusted to dehydration so well that photosynthesis and growth continued even as water stress increased. Water loss is controlled by various means such as closure of stomata, position of leaves and rooting system. *P. maximum* makes a good quality hay and has a

high quality animal intake as verified by local eastend farmers. Average nitrogen percent in the Green Panic was 1.41%, which adds to its advantage as promising forage with good quality composition. Rhodes (*Chloris gayana*), Weeping Love (*Eragrostis curvula*), Common Bermuda (*Cynodon dactylon*) and Klein (*Panicum coloratum*) grasses were also evaluated for production and utilization. Weeping Love grass was the lowest producer in comparison with all tested varieties.

Legumes Perennial legumes have several advantages as a feed crop in the Virgin Islands: they can be utilized for grazing by cattle, sheep, goats and pigs, and they can be incorporated into grass pasture to improve its quality. Legumes are also drought resistant and tolerate a high pH (7.9-8.7). Results of several studies on tropical legumes have indicated that the perennial soybean *Nonotonia wightii*, Siratro (*Macroptilium atropurpureum*), Alfalfa Florida 77 (*Medicago sativa*), Centrosema (*Centrosema pubescens*) and Labab (*Lablab purpureus*) are the most promising tropical legumes adapted to St. Croix. Rating comparisons were made for mineral deficiency, stand performance, drought resistance and nutritional quality.



Weeping Love Grass trial indicated it was not the highest producer.



Festival Queen produced the highest marketable yield, with a possibility of a return of \$42,320 per year.



Wet season studies of UH N-69 tomato indicated less than 5% unmarketable with a total of 92,603g kg/ha prime for the market.



Bacterial canker on papaya cultivar PR6-65 was minimal in first year when using proper irrigation techniques.



Neutron probe determines soil water content as demonstrated by irrigation specialist Stephen Buzzdugan.

IRRIGATION WATER MANAGEMENT

The development of a competitive agricultural industry in the Virgin Islands requires the introduction of irrigation. Limited water and energy supplies indicate trickle as the appropriate irrigation method. The complexity of the tropical environment requires an integrated approach to irrigation: land improvement, tropical cultivars which are resistant to heat and diseases, and integrated pest management must be considered at the same time with irrigation.

Water for growing crops, or the uncertainty of sufficient quantities to grow crops on a planned, steady basis, has been a major constraint to successful farming in the Virgin Islands for decades. The main thrust of the irrigation research program has been irrigation water management for tropical crops, with emphasis on watermelon, tomatoes, and papaya. Previous research on Charleston Gray and other watermelon varieties showed severely low yields, with inadequate irrigation regime suspected as the reason. Other factors possibly contributing towards low watermelon yields identified in 1982 were inad-

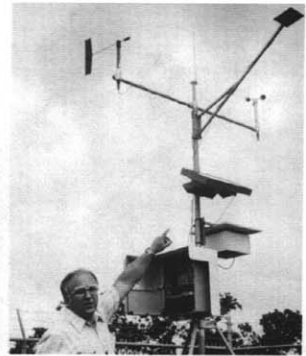
quate pollination because of the small number of bees observed visiting the flowers, severe attacks of anthracnose and other fungal diseases, even though Charleston Gray was considered to be disease resistant, and severe blossom-end rot in all plots.

Watermelon Trial In June 1983 an irrigation trial was begun with Glory (oblong) and Festival Queen (round) hybrid watermelons on 0.1 hectares of land, with harvest taking place in August and September. Each plot consisted of two rows of 12 plants mulched with black plastic. Both watermelon varieties received daily irrigation applications of four treatments (1.25, 1.00, 0.75, 0.50 CU ratio). The treatments were replicated three times. The trickle irrigation system consisted of Bi-Wall tubing buried at 8 cm. with orifices at 24" x 96".

Before transplanting, about 40 liters of chicken manure per row and 100 kg per hectare of complete fertilizer were incorporated into the soil. Complete fertilizer was injected twice a month and foliar fertilizer with trace elements was applied as nutrient deficiency



Research aide Kirk Benolt and research assistant Kendall Petersen harvest Glory (oblong watermelon).



CR-21 micrologger weather station.

symptoms developed. Weeds were controlled with Dacthal herbicide, while insects and diseases were controlled by weekly pesticide applications. Two bee colonies were placed near the watermelon field experiment a few weeks after planting to provide adequate pollination.

Results and Economic Returns

Trial results showed that Festival Queen irrigated at 1.25 CU ratio produced the highest marketable yield (103,618 kg/ha) and had the highest water use efficiency with 253.7 kg/ha/mm when irrigated with 0.50 CU ratio. (Table 1)

This watermelon study encouraged speculation on the possibility of high net returns for farmers raising watermelon in the Virgin Islands. Based on four crops per year, Glory variety could return \$33,120 per year with its highest yield of 94,000 kg/ha, and Festival Queen, yielding 103,000 kg/ha, could return \$42,320 per year. These figures are based on high marketable yields and high wholesale prices for vegetables in the U.S. Virgin Islands. (Table 2)

Tomato Studies Following a 1981-1982 study made on irrigation of tomatoes during the dry season, a second study was initiated in late 1982 to determine the effect of irrigation frequency and amount on tomato growth and quality during the dry season. A similar area of 0.6 hectares was planted with UH N-69 multiple disease and heat resistant tropical hybrids. Each plot consisted of three rows of 12 plants. The irrigation treatments on split-plot design were irrigation amount, CU ratio 1.25, 1.00, 1.75, 0.50 (main plot) and irrigation frequency, one and two days (subplot). The treatments were replicated three times.

The trickle irrigation system consisted of Bi-Wall tubing with orifices at 18" x 72" buried at 8 cm. The system included a volumetric valve, pressure regulator, 200 mesh filter, and two water meters for each treatment.

Approximately 7.5 tons per hectare of chicken manure and 100 kg per hectare of superphosphate were incorporated into the soil before transplanting. Side-dressing with a complete fertilizer was applied twice monthly after fruit set. Foliar fertilizer with major and trace elements was applied as nutrient deficiency symptoms developed. Weeds were controlled with Dacthal herbicide and additional manual and mechanical cultivation. Insect pests,

Table 1. Marketable watermelons Kg/ha

Irrigation Amount CU Ratio	Hybrid Watermelon	
	Glory (Oblong)	Festival Queen (Round)
	Marketable watermelon Kg/ha	
1.25	86,285	103,618
1.00	94,989	88,783
0.75	61,232	64,297
0.50	59,756	71,715

LSD_{0.05}: Between varieties at the same level 18,705 Kg/ha.
Between varieties at different amount levels 17,685 Kg/ha.



Visitors enjoy freshly harvested tomatoes during a field day workshop.

1. Net Return per hectare/crop (4 crops/year)					
Crop	Marketable yield kg/ha	Wholesale Price	Gross Income (considering 5% loss)	Variable Cost	Net Return
U. S. d o l l a r s					
Hybrid Watermelon					
Glory (oblong)	94,000 (1983)	0.55/Kg	49,120	11,000	38,120
Festival Queen (round)	103,000 (1983)	0.55/Kg	53,820	11,500	42,320
2. Income and expense budget					
Item	Per Crop		Total (4 crops/year)		
Income/hectare of watermelon 94,000 Kg/ha \$0.55/Kg	49,120		196,480		
Expense	15,500		62,000		
Net cash balance	33,620		134,480		

fungal and bacterial diseases were controlled in cooperation with the Pest Management Program.

Tomato Yields Tomatoes were harvested twice weekly from October 12 to December 2, 1982. The greatest response to irrigation, with 92,603 kg/ha marketable tomatoes, was obtained with 1.25 CU ratio but no significant differences at 0.05 level between treatments were found. There were significant differences between irrigation amount treatments at 0.1 level. The unmarketable yield averaged under 5%. By monitoring insects and diseases, the pesticide applications were reduced compared to a standard weekly schedule.

In a later study of the economic advantages and disadvantages of trickle irrigation on tomatoes in the Virgin Islands, a comparison was made of wet and dry season irrigation showing a marketable yield of 55,000 kg/ha during the dry season for a net return

of \$62,875 and the wet season yield of 92,000 kg/ha with a net return of \$115,600. (Table 3)

Papaya Studies In papaya studies, PR6-65 papaya for processing and fresh consumption was planted March 16, 1984 to determine the effect of irrigation frequency and amount on growth and quality. Plants were spaced 1.82 m in a row on a total experimental area of 0.07 hectares. The irrigation treatments arranged on split-plot design are irrigation amount, CU ratio 1.25, 1.00, 0.75, 0.50 (main plot) and frequency, one and two days (subplot). The treatments were replicated three times.

The trickle irrigation system consisted of Ry-Pol tubing and two emitters per full grown plant. An automatic valve, pressure regulator and two water meters were used for each treatment, with rain catchment water filtered by 200 mesh filter.

A quantity of 0.300 kg superphosphate per plant was incorporated before planting. Side dressing with nitrogen and complete fertilizer was applied twice a month, and trace elements applied as nutrient deficiency symptoms developed. Weeds were controlled with Dacthal herbicide and additional mechanical cultivation; pesticides were sprayed weekly. Although the study is still ongoing, field observations thus far have revealed only 1% of the plants were affected by diseases initially, and that papaya responds favorably to irrigation. Preliminary calculations on irrigated PR6-65 papaya show that by using trickle irrigation and good cultural practices, it is possible to obtain one full crop of papaya despite incidents of bacterial canker disease. Many farmers have visited the field experiments on watermelons, papaya and tomatoes and, as a result, have introduced not only proper trickle irrigation systems,

but also soil improvement, bee colonies for pollination, and use of tropical hybrids to augment the effectiveness of their farm operations.

Weather Station Irrigated crop production is related to many environmental factors including atmospheric conditions. A CR-21 micrologger weather station was installed at the experiment station to measure solar radiation and precipitation. The weather station is powered by solar cells backed up by rechargeable batteries. Similar systems could be used for irrigation scheduling for agricultural producers. In order to have accurate data, the neutron probe, an excellent method of soil-water content determinations on irrigation research, was installed also along with an IBM PC computer system to be used in analyses of field research data and weather conditions.

Table 3. Economics of Trickle Irrigated Tomato in the U.S. Virgin Islands

1. Net Return per Hectare					
Crop	Marketable yield kg/ha	Price	Gross Income (considering 5% loss)	Variable Cost	Net Return
U. S. d o l l a r s					
UH N-69 Tropical Hybrid Tomato	55,000 (1982)	1.50/Kg	78,375	15,500	62,875
	92,000 (1982)	1.50/Kg	131,100	15,500	115,600
2. Income and Expense Budget					
Item	Per Crop		Total (3 crops/year)		
Income/hectare of tomato 55,000 Kg/ha \$1.50/Kg	78,375		235,125		
Expense	25,500		76,500		
Net Cash Balance	52,875		158,625		



Evaluation of nematicide used on cassava intercropped with Cavendish banana was conducted over 3-year period.

BANANA AND PLANTAIN STUDIES

Most of the banana production in the Virgin Islands is on a small scale, using varieties of varying plant height and yield potential. Any large scale production will depend on utilizing well-known cultivars that are not too tall and which will produce fairly large sized uniform bunches. Three varieties obtained in 1981 from WINBAN in St. Lucia have been studied—Giant Cavendish, Robusta and Valery (Musa AAA) suckers. Although producing more uniformly shaped bunches, the Robusta and Valery plants are taller (1.8m-2.4m), have thinner pseudostems and are more prone to toppling than Giant Cavendish. The latter plants are sturdier, thicker and have more leaves at fruiting. Final studies in 1984 revealed that Robusta variety produced the heaviest bunch. In two harvests the average bunch weight for Robusta was 5.0 and 3.7 kg heavier than Valery and Giant Cavendish, with 25.8 and 11.8 more fruits per bunch in each respective harvest. (Table 1)

Tissue Culture The present demand for bananas in the Virgin Islands is estimated at approximately 2270 kg/week (5000 lbs.) Most of these are now imported from neighboring Caribbean islands, mainly Puerto Rico and Santo Domingo. In general, a main constraint to meeting the demand

through local production has been the lack of healthy planting material, which because of Plant Quarantine restrictions cannot be readily supplied from neighboring islands. The mass production nature of clean plantlets produced in tissue-culture is ideal for establishing large acreage in areas such as the Virgin Islands. However, plantlets shipped from laboratories usually must undergo a period of hardening off and acclimatization for successful establishment. As a result, studies were conducted to evaluate the feasibility of shipping tissue-cultured banana clones into the Territory. Results of this investigation indicated that Giant Cavendish plantlets shipped into St. Croix can be transplanted using a synthetic growing mix with a 80-90% survival rate. Although delayed transplanting overall produced better plants, delayed transplanting for 3-6 days using forestry trays gave the biggest and most healthy plants. This

method of delayed transplanting and of using forestry containers in establishing banana plantlets is already being used by the V.I. Department of Agriculture which has successfully established several thousand plants for distribution to farmers.

Attacking the Problem Major problems affecting banana production in the Virgin Islands are parasitic nematodes and the banana root borer (*Cosmopolites sordidus*). Determining a successful fertilizer program suited to local soil conditions is also important. A study begun in 1980 has attempted to select an appropriate nematicide that may have a dual effect on nematode and borer control and to make recommendations on optimum rates and constituents of fertilizer for Cavendish Banana (suckers). The most effective nematicide appears to be Furadan (carbofuran) 5%G at 20g per plant applied at four monthly intervals. Well rotted chicken manure at 5.5 kg yearly or ammonium sulfate at 1.4 kg yearly (applied at two month intervals) produced the heaviest bunches of fruits. However, a combination of chicken manure and Furadan 5%G was the most successful treatment with plants yielding bunches weighing 22.7 kg.

Yield data for the first and second ratoon crops were severely affected by tropical storms in the summer of 1982. Most toppling or uprooting of plants occurred either in untreated plots or those receiving Diazinon 2E soil drenches, which indicates the beneficial effects of nematicides on

Table 1. Yield and Growth Characteristics of Three Varieties of Bananas

Varieties	Height at shooting	Width at shooting	Yield bunch kg	Hands/ bunch	Fruits/ bunch	Leaves
Robusta	1.8 m	12.2 cm	15.0	7.8	111.6	9.2
Valery	1.9 m	13.5 cm	10.0	6.3	85.8	7.3
Giant Cavendish	1.8 m	13.2 cm	11.7	7.0	100.5	8.3

sturdy root development. Although several plant parasitic nematodes, including *Radopholus similis*, have been recovered in soil and root assays, thus far no clear pattern between nematicides and nematode populations has emerged. No corm borers have yet been found in any plants and minor outbreaks of Sigatoka leaf spot have been cleared up by immediate pruning and destruction of infected leaves.

Explant Evaluation A field experiment of Giant Cavendish banana explants completed in 1984 evaluated two planting methods (hand dug and tractor dug holes), two fertilizer treatments (chicken manure and ammonium sulphate) and two nematicides (Temik 10%G and Furadan 5%G). After completion of two harvests the best yield was 33.5 kg for two bunches obtained with ammonium sulphate (NH_4SO_4) and Temik (aldicarb), utilizing hand dug holes. (Table 2)

The second harvest revealed taller and wider stems at shooting than the first harvest. The average height and width in the second harvest was 2.01 m and 16.5 cm respectively, compared to 1.7 m and 14.2 cm in the first harvest. With respect to nematode assays, the most important fact was the total absence of the burrowing nematode (*R. similis*) which is the one usually causing major damage in both bananas and plantain (Table 3). A better control of Rootknot and Spiral nematodes resulted from using different treatments which, however, were not as effective on Reniform nematode. No appreciable difference was observed between the two methods for preparing the hole.

In general, comparisons with the Giant Cavendish explants of the previously mentioned study, the yield difference is obvious. The Giant Cavendish suckers averaged 11.7 kg/bunch while the explants averaged 15.1 kg/bunch.

Table 2. Yield and Growth Characteristics of Giant Cavendish Explants in Two Harvests

Treatment	Days from Shooting to Harvest		Yield/Bunch/Kg		Fruits/Bunch	
	1st harv.	2nd harv.	1st harv.	2nd harv.	1st harv.	2nd harv.
NTA*	74	91.2	12.1	18.7	114.7	145
NFA	77	59	11.7	18.9	116.2	135.4
NA	75	66.9	12.9	17	105.2	145.3
CA	72	83.7	12.5	16.2	120.5	127
CFA	77	80.7	13	15.7	119.8	143
CTA	79	66	13.8	16.9	119.8	141.7
\bar{X}	75.7	74.6	12.7	17.2	116	139.5
NTB	76	76.8	14.7	18.8	109.5	130.2
NFB	75	59.6	11.9	17.5	114.4	143.4
NB	75	59.4	10.9	17.1	133.6	135.5
CB	69	67.5	12.7	18.4	126.3	142.8
CFB	68	81.5	13	15.8	115.2	139.6
CTB	79	71.7	12.8	19	117.3	140.5
\bar{X}	73.6	69.4	12.7	17.8	119.4	138.7

*N - NH_4SO_4
T - Temik 10%G
A - Tractor dug holes
B - Hand dug holes
F - Furadan 5%G
C - Chicken Manure

Table 3. Mean Number of Major Nematodes Extracted from 100 cc of Soil from Rhizosphere of Giant Cavendish Bananas Grown from Explants

Treatments	Root-Knot	Spiral	Reniform	Total popul.
NTA*	71.6	9.3	45.3	126.2
NFA	37.3	16	78.6	131.9
NA	28.3	52	200	280.3
CA	43.3	8	132	183.3
CFA	76.6	22.6	93.6	192.8
CTA	60	30.6	136	226.6
NTB	34	70.3	382	486.3
NFB	35.3	18.6	306.3	360.2
NB	92.6	17.6	136	146.2
CB	24.6	17.3	317.6	359.5
CFB	88.6	6	126	220.6
CTB	48.0	48.0	351	447.0

*N - NH_4SO_4
T - Temik 10%G
A - Tractor dug holes
B - Hand dug holes
F - Furadan 5%G
C - Chicken Manure



A citrus orchard was established to provide a germplasm collection for scion material to be used in grafting.

Priority Crops Plantains and cooking bananas have been cited as the priority crops of the world's starch fruits, in a listing of global crop priorities (1982 Annual Report of the International Board for Plant Genetic Resources.) Like banana, plantain plays an important role in the diet of many Virgin Islanders, but this crop is also affected by the same problems of pests, lack of information on fertilizer requirements and nonavailability locally of large quantities of good planting material. The Maricongo or Horn type of plantain is popular with local residents while the Dwarf Plantain with its short stocking stem is suited to local windy conditions. In December 1982 a field study of Maricongo and Dwarf Plantain tissue-cultured clones was begun, using methods described previously for Giant Cavendish plantlets. A report on the plant crop performance over a two-year period indicated several significant factors. Of major significance was the genetic variability of clones as evidenced by the appearance of Congo or French type plantain in approximately 22-31% of the plant population (Table 4). Although these variants produced heavier bunches, fruits were irregular in size and smaller than those of true Maricongo and Dwarf Plantain. Plantains are noted for their genetic instability and it would appear that even tissue-cultured clones do mutate. The Dwarf Plantain showed a 19% reversion to Dwarf French Plantain. This latter cultivar is unique to this area since there are no reports of its wide-

spread occurrence in the Caribbean. The variant Dwarf French typed yielded 46 tons/ha with bunches averaging about 226,460 fruits/ha. The Regular Maricongo or Horn Plantain yielded only 14.4 tons/ha or about 61,841 fruits/ha. The mutant Dwarf French Plantain produced in this trial appears to be well adapted to local conditions and further ratoon crops are being closely monitored for yield, and agronomic and variability characteristics.

At the same time of the above studies, a field evaluation of Maricongo Plantain tissue-cultured clones using four fertilizer systems was conducted. Fertilizers applied over the two-year period of the trial included water containing Tilapia fish manure, slow release urea (IBDU), both ammonium and potassium sulfate and 10.10.10. After one and one-half harvests were completed, the average weight per bunch for all treatments

together was only 5 kg, an indication that Maricongo is not well adapted to the soil of the Agricultural Experiment Station.

TROPICAL FRUIT ORCHARD

The original objective of this project was to establish a one-acre orchard of local tropical fruit species particularly adapted to soil and climatic conditions of St. Croix. In 1983 the addition of nine species of fruits brought the total to 25 species, with five more added in 1984. These new additions include:

- Star Apple - *Chrysophyllum cainito*
- West Indian Plum - *Spondias sp.*
- Breadfruit - *Artocarpus communis*
- Breadnut - *Artocarpus communis*
- Pomegranate - *Punica granatum*
- Governor Plum - *Flacourtia indica*
- Egg Fruit - *Pouteria campechiana*
- Sapodilla - *Achnas sapote*
- Gooseberry - *Phyllanthus acidus*
- Feijoa - *Feijoa sellowiana*
- White Sapote - *Casimoroa edulis*
- Carob - *Ceratonia siliqua*
- Strawberry Guava - *Psidium cattleianum*

Passion Fruit - *Passiflora edulis*

In April 1983, a drip irrigation system was installed using ¾" poly head lines. Watering is controlled automatically by two water watches set ½ hour per day at 20 psi water pressure using a potable water supply source.

Table 4. Yield and Growth Characteristics of Plant Crop of Regular Maricongo and Dwarf Plantains Grown from Explants

	Regular	Dwarf	Non-Maricongo Type
Yield (tons/ha) ^z	16.1	20.3	38.9
Fruits/bunch	31.0	34.8	76.9
Height at shooting (m)	2.5	2.1	2.1
Stem Girth at 1m (cm)	50.4	54.7	51.7
Days to shooting	326.2	338.5	302.5
Days from shooting to harvesting	71.4	78.2	85.0
No. leaves at harvest	11.6	13.5	13.4
Percentage Non-Maricongo	23.5	31.2	

^zBased on a plant population of 1742 plants/ha.

“ST. CROIX PAPAYA DECLINE”— A DISEASE PUZZLE



Evaluation of various canker resistant cultures was ongoing at the pathology greenhouse over past two years.

Bacterial canker of papaya has been implicated as a component of the disease syndrome known for years as “St. Croix Decline.” Also called “Papaya Decline Disease,” this disease has caused a serious problem with papaya production, resulting in the request for a 406 grant to undergo a comprehensive study of the syndrome. Approval of the grant was received and work started in July 1983.

Resistant Varieties The first year’s research focused on finding resistant varieties of papaya to bacterial canker, investigating the effectiveness of bactericidal compounds, antibiotics and microbial antagonists for disease management, determining a taxonomic classification of the organism and factors influencing disease spread.

Consequently, a total of 26 varieties were screened in six separate trials for resistance to bacterial canker. Of these, six varieties were shown to have a significantly higher tolerance to infection in greenhouse trials. (See Table 1.) Also, to determine the ability of promising papaya varieties to resist or tolerate infection in the field, a variety orchard was established which contains the most promising varieties. One of these, Barbados 2X, appears not only to possess a high tolerance to bacterial canker but also appears to be better adapted to growing conditions unique

to St. Croix—sporadic rainfall, high winds, and alkaline soil with low nutrient levels.

Treatments and Observations A 200-tree planting was established to evaluate the effects of various bactericidal compounds, antibiotics and selected microbial antagonists upon disease impact and population fluctuations of the pathogen. Evaluations of pathogen recovery from leaf surfaces and of disease severity showed no significant differences among the treatments and controls.

Observations made upon experimental papaya plots used for irrigation studies indicated that the pathogen was disseminated by wind and rain rather than being soil borne. Subsequent experiments showed that the disease organism is well adapted to survive on the leaf surfaces of papayas and to produce copious inoculum from leaf and stem lesions. Experiments designed to determine the pathogen’s ability to survive in the soil show that under dry conditions the organism cannot survive longer than two weeks and under moist conditions less than one week.

Taxonomy Many years ago the causal agent of a similar disease in Java was determined to be *Bacillus papayae*, later placed in the genus *Erwinia*. Efforts to determine the bacterium’s taxonomy have shown it to possess no

unique overall biochemical or physiological characteristics. However, the bacterium is shown to be different from the bacterium reported by Trujillo and Schroth from the Marianas Islands and isolates of the pathogen have been sent to Drs. Schroth and Hildebrand at the University of California at Berkeley for DNA homology typing to give a more accurate picture of where the bacterium should be categorized taxonomically.

In the second year study of the bacterial canker research continued on the susceptibility of papaya cultivars to the pathogen. It was found that variations in susceptibility were observed for the same cultivars in both spray and wound inoculation trials. Least susceptible were Barbados Dwarf 2X, Trinidad Pink, STT 638-1, and PR 10-65. The remaining cultivars were extremely susceptible and not significantly different from one another.

Intercropping An inter-cropping system for disease management utilizing papaya, pigeon pea, pineapple and cowpea was established. Preliminary evaluations have shown a decreased incidence of bacterial canker as well as papaya ringspot virus in the papaya intercrop as compared to monocultures.

Seasonal Affects Observations of losses occurring from disease outbreaks show that this disease is most destructive on St. Croix during the short rainy



Culture of pathogenic bacterium is tested at pathology lab.

seasons, although symptoms may be observed throughout the entire year. Rainfall does not appear to increase pathogen survival or symptom severity and in fact, symptom severity appears to be decreased by 72 hours of free moisture. This seems to indicate that the pathogen is well adapted to the semi-arid climate of St. Croix.

Controls Studies have also shown that the bacterium may survive for indefinite periods in the cankers and leaf infections of affected papaya trees and on the leaves of tomato and cantaloupe. Attempts to control the disease with bactericides, antibiotics and other agents have not yet been successful. Presently the most effective control is the use of resistant cultivars, the most promising of which, thus far, is the Barbados Dwarf. Another control strategy being investigated is the use of

suitable barrier crops—those that do not support epiphytic populations of the pathogen, such as cassava, banana, and pigeonpea. Observations of small local farms where papayas are commonly intercropped with a wide variety of fruit and vegetable crops have shown a lower incidence of the canker disease than is found in monocultures.

Use of the term "St. Croix Papaya Decline" has now been shown to indicate a variety of factors, *i.e.*, nutrient or water deficiencies, virus infections, etc., which affect the normal development of papaya. Many symptoms, such as greasy spots on papaya stems caused by viral infections, are often misdiagnosed as bacterial cankers. Because of the confusion surrounding the term "St. Croix Papaya Decline Disease" it is proposed that it be replaced with "bacterial canker of papaya."

SOIL SOLARIZATION RESEARCH

In soil solarization research which was started in 1983, the crops and their diseases targeted for study in order of priority based on severity of need and economic considerations were fusarium wilt, damping off and root knot nematode in tomato, pepper and eggplant; papaya root rot; stem rot of watermelon; crown rot of thyme; and whorl rot of pineapple. The results of trials made on two off-station and three on-station sites over a nine-month period showed that soil temperatures did not attain the required high temperatures necessary for the disinfection of soil-borne pathogens. Maximum temperatures obtained under polyethylene mulch during the six week solarization periods were 48, 44 and 41 C at 8, 15 and 23 cm, respectively, for the months of June and July. Plots that were not mulched attained temperatures of 38, 33 and 31 C at the same depths.

In trials conducted during the months with cooler temperatures and/or shorter days, both mulched and non-mulched plots were 2-5 C cooler. However, disease and yield evaluations could not be made on these plots because of damage caused by an unseasonable tropical storm. Disease incidence was low in the remaining trials since most of them were conducted on small, privately owned farms and artificial inocula could not be used. Results indicated there were no significant differences in yields or losses due to disease between the solarized and non-solarized plots; air temperatures and total solar radiation were lower than average for the 1983-84 testing period. Other results have shown that solarization is not effective in rocky or hilly areas where rototillers cannot be used to loosen the soil or in areas where water availability restricts the maintenance of moisture under tarped areas.

Table 1. Relative Variety Susceptibility

Variety	Most Susceptible	Moderately Susceptible	Least Susceptible
Waimanalo	+		
Kapoho	+		
Sunrise	+		
Higgins	+		
Wilder	+		
P.R. 6-65	+		
P.R. 6-65 Improved	+		
P.R. 6-65 Dwarf		+	
P.R. 7-65	+		
P.R. 8-65	+		
P.R. 9-65	+		
P.R. 10-65		+	
S-64	+		
Catie 12914	+		
Catie 12915	+		
Catie 12917	+		
CVI 283-1	+		
CVI 283-2	+		
CVI 383-1		+	
CVI 383-2		+	
CVI 483-1	+		
CVI 583-1	+		
Trinidad Pink "x"	+		
Trinidad Pink		+	
Trinidad Yellow	+		
Barbados Dwarf "2x"			+



Eight varieties of sweet potatoes were evaluated for resistance to sweet potato weevil.

WORKING WITH NATURE – BIOLOGICAL CONTROL

General pest and pesticide management research has been a diversified collaborative effort, with Station and outside scientists working to build an information base on the local plant and animal pest situation as well as evaluating alternative control methods which stress reducing the risks of pesticide use. A main emphasis at the experiment station is the development of biological control projects for major local insect pests. One of these projects produced results which may have far-reaching affects, both in the V.I. and on the mainland.

Insect Discovery As the result of work initiated by the pest management program leader and continued in collaboration with entomologist Dr. Roger Bland from Central Michigan University in 1983, a beneficial insect new to science was discovered and described. The parasitic ichneumonid wasp from St. Croix named *Agrypon caribbaeum* Bland was later announced in the January 1984 issue of the *Annals of the Entomological Society of America*. The wasp holds great promise as a natural enemy for the biological control of melonworms, a

serious pest of cucumbers, melons and squashes in the Caribbean and elsewhere. Collaborative efforts with USDA staff in Mississippi and South Carolina have led to the establishment of a laboratory colony of this newly described species. Over 1000 parasitized melonworm prepupae and pupae were sent to the U.S. Department of

Agriculture's Stoneville Research Quarantine Facility in Mississippi and the wasp underwent field trials in Florida in 1984.

Beneficial Insects In March 1983, Dr. Kent Elsey, entomologist at the U.S. Vegetable Laboratory in Charleston, South Carolina, spent

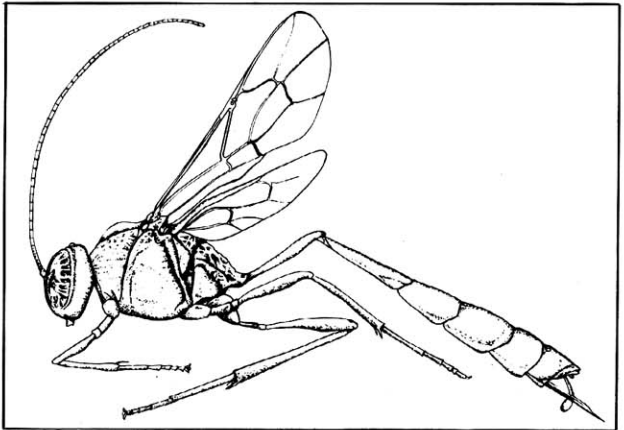


FIG. 1 A new ichneumon wasp, *Agrypon caribbaeum* (above), natural enemy of the melonworm, was reared on St. Croix, and is being studied as a biocontrol agent of the melonworm.

several days in the Virgin Islands exploring for *A. caribbaeum* and other natural enemies of both the melonworm and the pickleworm. A productive visit by the AES entomologist to Barbados in August 1983 gave a further boost to Virgin Islands' biological control efforts as records of the Commonwealth Institute of Biological Control revealed information on beneficial insect introductions into St. Croix done several decades ago which apparently were never published. The prospects for introducing natural enemies of several important local crop pests are now more encouraging, particularly of the diamondback moth (cabbage family pest), the fall armyworm and the coconut-scarring mite, among others.

Dr. Bland and the AES entomologist also published two short notes on insecticides and acaricide evaluations done with Bland on local crops, and a co-authored paper entitled "Preliminary Studies on the *Culicoides* spp. Associated with Ruminants in the Caribbean Region." The latter concerns the bluetongue virus and was published in the international journal *Preventive Veterinary Medicine* Vol. 2 (1984): 389-399. This project has now been terminated after 2½ years, due to lack of funding at the level required.

Plantain Clones A field experiment with tissue-cultured clones of

plantains begun in 1982 was the subject of a paper co-authored by the pest management entomologist and research horticulturist Christopher Ramcharan, senior author. Entitled "A Preliminary Evaluation of Field Planted Maricongo and Dwarf Plantains Grown from Explants . . ." the paper was presented in September 1983 at the 19th Annual Meeting of the Caribbean Food Crops Society. Among other results, there was a notable absence in these tissue-cultured plants of burrowing nematodes and black weevil borers, usually prevalent pests on this crop.

Sweet Potato Weevil The second of two field experiments evaluating eight varieties of sweet potatoes for resistance to the common sweet potato weevil (*Cylas formicarius elegantulus*) was completed in 1983. The varieties most promising were "White Star," "W119," and "Porto Rico," but none showed sufficient resistance to justify recommendation.

Weed Hosts A week-long survey of weed hosts of viruses was conducted on St. Croix, St. John and St. Thomas with a team from Puerto Rico Agricultural Experiment Station led by Dr. J. Bird-Pinero, Professor of Plant Pathology and Virology. Over 30 species of weeds and other plants harboring viruses of potential or actual economic

significance were catalogued at numerous locations throughout the islands. Viruses which use weeds as alternate hosts can be transmitted to economic plants in various ways. This work seeks to elucidate the role which weed-harbored viruses play in agriculture, and to contribute to existing information on the host-to-host transmission cycle. During the survey, about 40 specimens were added to the diagnostic herbarium.

Pest Lists With the assistance of specialists at the Insect Identification and Beneficial Insect Introduction Institute (USDA) and elsewhere, about 100 species have been added to the list of insects of St. Croix, and new lists have been started for the other two islands. Plant disease and host lists are also being developed, along with lists of weeds and other significant pests. Since receiving an excellent series of 80 slides of Virgin Islands scale insects (Coccoidea) from the collection of Dr. M. Kosztarab, world Coccoidea specialist, identification of these scale insect pests of local plants has been greatly enhanced. The slides are the result of a joint survey made by the AES research entomologist and Dr. Kosztarab, and form a significant part of a scale insect checklist of the V.I. being prepared by S. Nakahara, USDA Systematic Entomology Laboratory, which should be available soon.

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Cooperative Extension Service

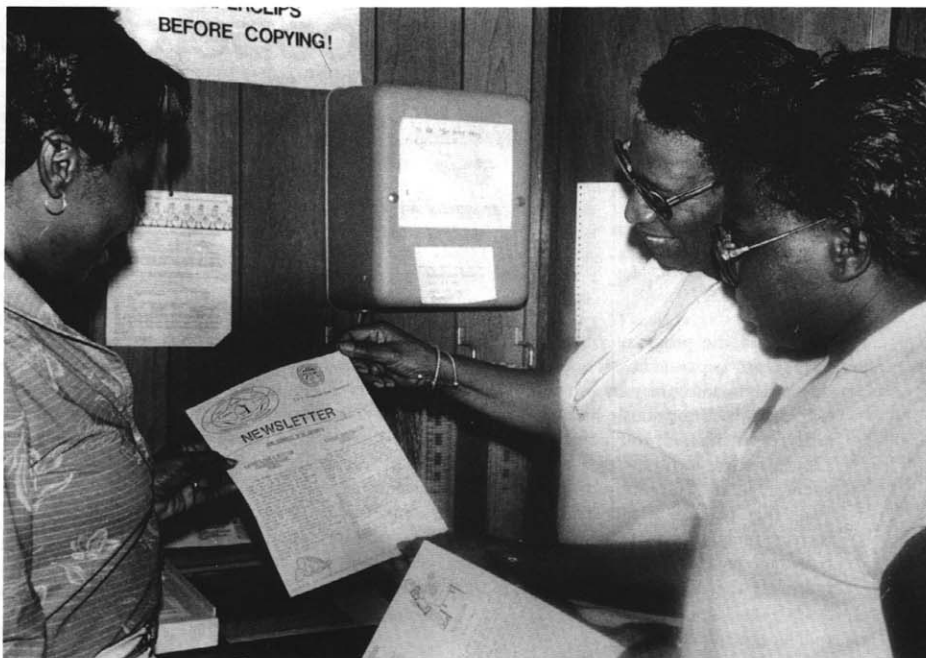
Many of the programs which comprise the Cooperative Extension Service (CES) have greatly expanded their outreach in the past two years, more clearly defining their role in the community by providing an enrichment for thousands of program participants which previously had been unavailable. As CES continuously explores and analyzes its mission, one point becomes apparent: it is possible to expand program subject matter into new areas which have not been reached by other programs and agencies in the community—and to achieve an enthusiastic response by doing so. Fears that perhaps island residents might be embarrassed to attend a seminar on teenage pregnancy or that there are not enough farmers interested in improving their pastureage have proved groundless. The large keenly interested attendance serves as a guideline that CES is definitely on the right track!

THE EXTENSION MESSAGE—THROUGH MANY MEDIUMS

Extension Communications conveys the extension message to clients and the public in as many mediums as are available. Whether it is through factsheets for farmers, gardeners and livestock producers, or bulletins, booklets, pamphlets, newsletters and reports for anyone that is reachable and interested; whether it is through television, the daily local newspapers or radio talk shows—Extension Communications is ready to get the message out through news releases, captioned photos, weekly columns, feature stories and guest appearances on radio shows. By publicizing the events which cram the calendars of the many Virgin Islands extension programs, the assurance is there that the classes will be filled, the seminars and workshops well attended.

New Publications New publications brought out by Extension Communications included two handbooks. Extension Handbook No. 1 entitled "Island Insects" is for teachers, parents and apt students of nature to help identify insects, collect them and preserve them. The 50-page compilation supplemented with much original material has been adapted specifically for use in the Virgin Islands and has proven to be a great help to all who are interested in natural history and the world of insects. Extension Handbook No. 2 entitled "Virgin Islands Beef Cattle Improvement Handbook" was printed to assist beef cattle growers keep accurate records. The 32-page booklet contains instructions on performance testing, sample records and recordkeeping sheets designed by the

extension animal science program to aid commercial cattle growers in the islands. Also published were three extension bulletins: "Virgin Islands Cooperative Extension Service: A Model for Technology Transfer Systems in the Caribbean," "Avocado Production and Marketing," and "Sorrel Production and Marketing." The technology transfer bulletin has gone into a second printing, due to its popularity as an information resource pertinent to creating an Eastern Caribbean Center at the College of the Virgin Islands. It is proposed that the Center will offer cooperative programs of study, research and training for the people of the Eastern Caribbean region with an ultimate goal of encouraging cooperation between the nations of the region and the United States.



Newsletter informing the public of events occurring in 4-H, Agriculture and Home Economics (shown) appear quarterly throughout the year.

Booklets and Reports The avocado and sorrel booklets provide information on producing the popular fruits all the way from cultivation to harvest as well as the economics of production and recipes using the fruit. Other publications include a pest management factsheet on the banana root borer; a farm management factsheet on accounting methods for farmers; and a special College booklet entitled "College of the Virgin Islands—Our First 22 Years," a 28-page overview and history of the College.

Earlier Reports In 1983, the combined Experiment Station and Cooperative Extension Service annual report

was published for the years 1981 and 1982. As an indication of the increased size, scope and number of land grant programs in the Virgin Islands, the report contained 42 pages and 98 photographs compared to 21 pages and 36 photographs in that of the 1979-1980 report. In all, a total of 6,519 extension publications were distributed by mail or personal contact from October 1982 to September 1984.

News Media In that period also, a total of 224 press releases were written and dispensed to 12 media destinations for an overall total distribution of 2,688. In addition, 74 photographs with captions were released over the

two-year period and the popular Pest Management gardening column called "From the Ground Up" appeared each Monday in the *Avis*. On Friday mornings extension specialists were featured on the hour-long "Conversation Show" emanating from St. Thomas over WVV1 and also participated in the Miss J. Show over WSTA on several occasions. Newsletters were distributed throughout the islands by the Agriculture, 4-H and Home Economics programs on a quarterly basis.

GROWING OUR OWN

The Agriculture Program at extension covers many aspects of food production. From fruit and vegetable culture, including soil and water analysis and diagnosis, to pesticide applicator training, small livestock management, improvement of pastures and dairy herds. The main thrust of the program is to offer assistance, ideas, training, and advice to our gardeners and farmers so they can become more self-sufficient at the same time they learn about their responsibility for good stewardship of the land and its creatures.

Growing Forage Crops A significant number of livestock farmers in all districts have begun to focus on local feed production since, with a decline in sorghum acreage, efforts of farmers have shifted to their own pasture development. Farmers were assisted in the procurement of adapted grass and legume seeds and fertilizers while receiving technical assistance in planting and management procedures. A new emphasis is in the establishment of forage crops demonstration plots utilizing four legumes, three grasses

and two legume-grass mixtures. The demonstration plots have informally attracted farmers and other visitors almost daily to the site located opposite the entrance to the College campus and several farmers have planted acres to buffel, green panic and pangola grasses.

Livestock Demonstrations On St. Thomas, five result demonstrations were initiated for acacia control, pasture legumes, leaf miner control on tomatoes, chemical weed control on thyme, and onion root rot control. Plans were made to revitalize livestock associations on all three islands and in 1984, some 115 livestock farmers attended initial planning meetings followed by a small livestock management seminar attended by 104 farmers held on St. Croix. Specialists lead discussions on common herd health problems, breeding, management, feed and nutrition, and training and grooming animals for show. A new livestock breeding and marketing system, referred to as "The Small Livestock Exchange System," was begun in

order to eliminate inbreeding of sheep and goats, and 15 individual farmers were assisted in designing management systems unique to their livestock operations.

Working With Groups In all, a total of 2,081 island gardeners, farmers and breeders attended the many workshops, seminars, field demonstrations, short courses and lectures offered by the extension agriculture program. Subject matter included fruit tree management, tomato production and marketing, growing fruit trees, vegetables in containers, tropical tree propagation, and management of woody ornamentals.

Extension was helpful on both St. Croix and St. Thomas in assisting island farmers launch the St. Thomas/St. John Farmers Association and the St. Croix Farmers Cooperative Association. On St. Thomas, in particular, the emphasis in outreach was on group programs, with extension providing classroom training to such groups as UJAMAA Young Adults Training Program in organic gardening. Twenty-



Field days cover a wide variety of agriculture subjects. This group learns about terminal buds from horticulturist Clinton George.



School groups of all ages visit extension to learn about gardening.



Box gardens being watered by extension assistant Charles Smith are a successful concept developed by Extension to provide growing space for schools and apartment dwellers.



Grafting workshops attracted 145 participants, with 55% of those successful in propagating at least one type of fruit tree.

two young people received a full year of combined agriculture studies and field work. Garden projects with the Community Mental Health Center and the East End Mental Health clinic were established; workshops and seminars were held for the St. Thomas/St. John Hibiscus Society, the Orchid Society, Sr. Citizens Recreation Center, Dober School, Kirwan Terrace Housing Project, and agriculture programs were conducted at 11 other public and private schools. A full week of agriculture related topics were covered for the Department of Education's Summer Agriculture Program which enrolled 31 members on St. Croix.

Box Gardens Technical assistance in planning, care and maintenance of home gardens was given to 185 home gardeners on St. Croix. For those who do not have the garden space, box gardening has proved to be a boon. Designed by the agriculture program for families in housing projects, apartments or for school students in science and agriculture programs, workshops and demonstrations were held for

more than 250 residents. Several schools have already constructed box gardens modeled on plans provided by extension. Another program for home gardeners was a four session "short course," with 65 participants, many of them senior citizens, receiving "graduation" certificates.

Grafting Trees

Since more than 5,000 grafted trees are purchased annually from outside the Virgin Islands, a series of five propagation workshops were conducted to assist residents in grafting their own trees. Of the 145 participants who attended the workshops, 55% were successful in propagating at least one type of fruit tree. The highest rate of success was obtained from air layering lime trees and grafting avocados. Least effective were mesples (sapodillas) and mangoes.

Another help for ten farm producers was the installation of drip irrigation systems which resulted in better varietal selections and more efficient production, reportedly increasing their productivity by more than 100%.

Pesticide Applicators Eight pesticide applicator training classes were held for 54 initial first time applicators and 13 current applicators were recertified in 1983. A total of 59 applicators received certification status. In 1984 a total of 119 applicators were trained and certified. Since this is an ongoing program with both private and commercial pesticide operators certified every year, the number is quite high, reflecting an increased interest in the use of pesticides by growers. In addition, most of those certified have expressed willingness to be recertified, as new manuals are issued on the proper handling of restricted use of pesticides.

A pesticide locator booklet entitled "How to Locate Plant and Animal Protection Chemicals for Farm and Garden" was produced for all islands after a lengthy survey of pesticide dispensing business establishments. A pesticide storage, handling and disposal facility was designed to provide a functional model suitable for the agency's use.

Soil Testing The formal opening of the extension diagnostic soil testing laboratory on St. Thomas campus took place in February 1983, thus providing the Virgin Islands and the Eastern Caribbean area with a modern facility of benefit to all. In the first 20-month period, 1,405 soil, 244 water and 722 plant tissue samples were analyzed. Soils were analyzed for pH, organic matter, soluble salts, calcium, magnesium, potassium, nitrogen, phosphorus, sulphur, copper, iron, manganese, zinc and sodium. Fertilizers and soil amendments were recommended. Water was analyzed for salt and metal contents and plant tissue samples were measured for total nitrogen, phosphorus, potassium, calcium, magnesium, iron, copper, zinc, manganese and sodium. In the first year alone more than 200 farmers and home gardeners availed themselves of the new laboratory's services. A computer program form was written specifically for soil testing procedures and final results are reported using this form. In order to assist the first-time soil collectors, Factsheet No. 25 *Testing Soil for Better Yields*, and Factsheet No. 26 *Interpreting Your Soil Testing Results* were published to assist those with soil problems.

Among those touring the new lab were 20 members of the Caribbean Basin Administrative Group for Tropical Agriculture (CBAG) and 70 visitors to the St. Thomas Food Fair. One seminar was given for 22 persons in conjunction with the Perkin-Elmer Company of Connecticut on techniques of atomic absorption flame photometry, and approximately 100 clients attended four workshops on sampling soil and interpreting results on St. Thomas. On St. Croix 68 participants attended a seminar on soil management fundamentals with more than 150 soil samples taken by growers for analysis.

Dairy Herd Improvement The Dairy Herd Improvement Program (DHIP) conducted performance tests on an average of 570 cows monthly, with records maintained through the Raleigh Computer Center. The 80% participation by Virgin Islands dairy operators is the highest in the U.S. It has been found that most dairy cows under pasture conditions need added energy and supplemental minerals. Dr. C. Gibson, Associate Professor of Veterinary Services, Michigan State University, spent two one-week periods on St. Croix to assist with animal health programs, with particular emphasis on reproduction. As a result, the percent of cows in milk has increased up to 80% and the calving interval has been reduced nearly two months. In 1983 two of the five herds were enrolled on the computerized FARMX herd health program which provides dairymen with better management techniques overall. In 1984 the FARMX program was revitalized when the V.I. state veterinarian position was filled after being vacant for a year. The original two dairies were reinstalled and two additional ones were added. On St. Thomas, assistance was given to the local dairy and others in pasture improvement for their herds.

The rolling herd average for the August 1984 summary of the herds on test was 7,121 pounds of milk (- 2% under the last year and 51% of the Southern Region) for an average herd size of 137 cows (540 total cows on test.) There were 480 cows in milk (19% over the last year). The projected calving interval is 17 months (7% more than a year earlier but 14% over the regional average.) The average days in milk decreased 2% over the last year to 181. The average days open decreased to 238 days (16%) but was still 64 days (48%) longer than the regional average.



Agriculture Aide Alf Smith shows students from Alfredo Andrews School some of the vegetables which grow well in containers.

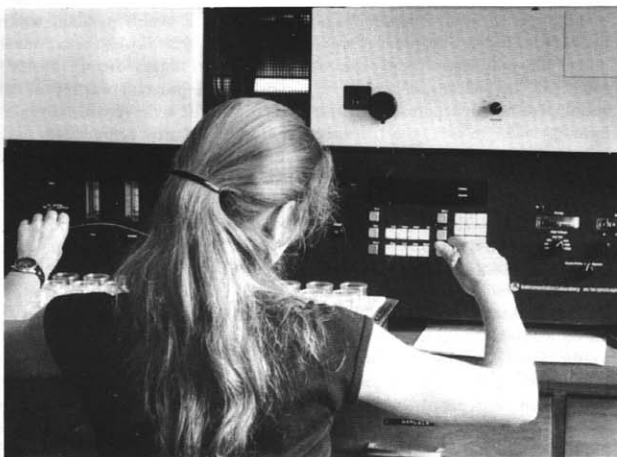


The extension FARMX herd health program provides dairymen with better management techniques.



Classes were conducted at the site, as special group of pesticide applicators from large industries were trained at Hess.

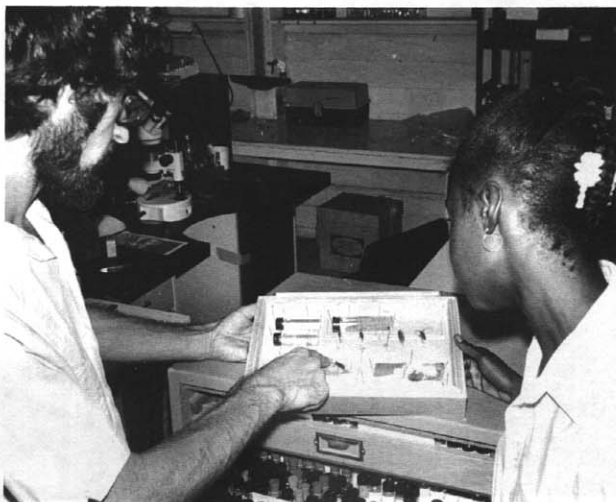
Beef Handbook In September 1984 the *Virgin Islands Beef Cattle Improvement Program (BCIP) Handbook* was published. This 35-page manual gives explicit details on the operation and various codes used in the on-the-farm performance test program, and is distributed to all requesting cattle growers in the Virgin Islands and elsewhere in the Caribbean. To assist in alleviating reproductive problems, the extension assistant in charge of the DHI milk program completed a week-long workshop on reproduction and artificial insemination in Florida, with the result that improved efforts are being made to reduce calving intervals and increase the genetic base of local herds. Four workshops on husbandry, records and showmanship were conducted for the 4-H/FFA Animal Husbandry Program to prepare participants for later judging of dairy calves at the annual Agriculture and Food Fairs on St. Croix.



Soil testing lab opened formally in 1983 and has analyzed thousands of soil, water, and plant tissue samples.

PEOPLE, PLANTS AND ANIMALS

General pest and pesticide management assistance covers a broad spectrum under categories which affect the health and welfare of people, plants and animals. Throughout the territory 23 seminars, workshops and lectures were presented in one year alone. Eleven result demonstrations were conducted for weed (8), insect (2) and disease (1) control of plants in response to specific requests in the same period. A very successful concept, that of community plant clinics held on Saturdays in shopping centers, became a popular monthly event, reaching some 3,040 persons in one year. Many who attended these clinics merely came to ask questions while others brought ailing plant specimens for diagnosis. Other outreach included pest management training for livestock producers and urban and forest tree managers.



Insect awareness starts at an early age. The Pest Management program has had an ongoing "Open House" for young people of all ages to augment their knowledge of harmful and beneficial insects.

Scouting for Insects A new crop monitoring program was begun in 1983. Cooperating producers were trained in monitoring their own crops in order to maximize crop quality and yield, and to reduce pesticide hazards. One full year of tomato scouting was completed on St. Croix, involving seven producers in 21 crops. In bananas, three producers and three perennial (continuous harvest) crops were involved in a trial program. Growers received instruction in pest scouting techniques and seven scouts became fully trained in identification of destructive and beneficial insects. As a result of the scouting, yield quantity increased 25% in tomatoes and 50% in bananas, according to comparisons with their own previous yields which were made by producers. Producer acceptance of the scouting program remains high, and a greater understanding of Integrated Pest Management principles was apparent for all cooperators at year's end. Indeed, failure to



Pest Management program leader Walter Knauenberger demonstrates the use of a pesticide sprayer at a Field Day Open House.



Students of junior and senior high school age chosen by principals from five schools took part in six-week training during summer in extension pest management and agriculture.

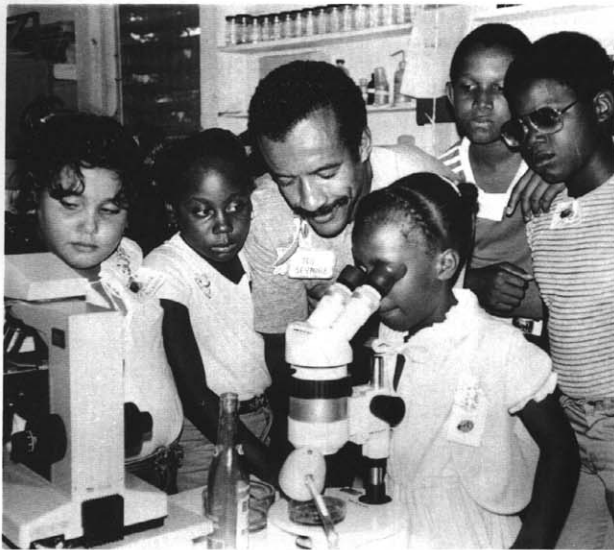
follow treatment recommendations based on scouting reports resulted in complete failure of certain crops in some instances. Scouting protocols were developed for cucurbits, avocados and mangoes. In many cases, biological insecticides are now recommended and being used for tomatoes and cucurbits.

Improving Grazing Lands A range improvement and vegetation management program was begun because rangeland constitutes by far the largest single use of land in agricultural production (75%) in the Virgin Islands. Much of this land has low grazing value due to erosion and undesirable plant growth. Nearly all rangelands are unimproved, poorly managed guinea grass pastures. The emphasis was on providing a baseline survey of the vegetation present on range and pastureland, to initiate weed control demonstrations, and to strengthen the

diagnostic herbarium in range plants represented. Nine St. Croix producers cooperated with this program initially. Plant collections were conducted in St. Croix pastures and the diagnostic herbarium now contains about 90% of the economically significant range plants. Field trials and qualitative rangeland condition surveys are continuing under the impetus of the extension natural resources sector. To increase productivity of rangeland and pastures and to reduce deteriorating acres, control procedures which are less environmentally disruptive than traditional methods such as bulldozing or "slash and burn" were urged for 60 producers who attended seminar-workshops and 15 producers who participated in field demonstrations. Two major weed management demonstration projects were undertaken in 1984, while two others were completed and reports submitted to the cooperating farmers and chemical manufacturers. Three of

the field trials involved *Acacia* spp. control, which is a major pasture problem. In addition to *Acacia*, tan-tan and thibet weed species were chemically controlled for one-half or less than the cost of locally traditional control methods.

Pesticide Locator At least 95% of all Virgin Islands suppliers of agricultural pest control products were included in an annual update of a pesticide locator entitled "How to Locate Plant and Animal Protection Chemicals for Farm and Garden." As a result, all inquiries for pest management recommendations received by the extension service can now be answered with accurate, timely, and targeted information about where to locate specifically desired products. Availability of pest control products is constantly increasing due to input by pest management staff to retailers on relative benefits and quantities of pesticides; 15% of the dealers adjusted their stocks dur-



Teacher Ted Seymore adjusts microscope at extension pest management lab for interested insect viewers.



Insect Natural History was an important learning experience for hundreds of St. Croix students like this one.

ing the past year. Two new clientele groups—livestock producers and urban plant management professionals—were reached with workshops which included pesticide management information. Two new chemical dealers opened for business on St. Croix in 1984. One had explicitly drawn on pest management advice for his ordering decisions. When feasible, organic insecticides are recommended. A serious deficiency has existed in the selection and availability of chemical and biorational pesticides. Livestock production, mainly beef and dairy, is the strongest agricultural enterprise, with heavy pesticide use. Pesticide exposure issues continue to generate much public interest, but misinformation is prevalent. Whenever possible pest management staff are interviewed on radio talk shows and conduct educational meetings to explain the uses and misuses of pesticides.

Insect Natural History for Kids Although environmental studies programs are enthusiastically received by teachers and their students, there are very few resource people available on the islands. In fact, only 15% of the teachers of science and mathematics in the Virgin Islands secondary schools are trained specifically in those fields. Thus, exposure of school children to natural history subjects, with the exception of an Environmental Studies Program (ESP) funded in the early 1970's on St. John in conjunction with the National Park System, has been minimal. In particular, students are rarely given the opportunity to gain insight into the world of insects, and the significant role that insects play in the ecosystem. The pest management program at extension developed a highly popular insect natural history program for school children ages 8-13 which reached 2,041 young people in 1982-83 (approximately 60% of the

school population in this age group on St. Croix alone). Sixteen of the 18 public and private schools, including 110 teachers, were involved. A main criteria for success of such a program rests not only on interesting, well-presented material by extension pest management staff but also the enthusiastic cooperation of the teachers which was evident as the program developed. Presentations were made in the classrooms at each school involved in the program, with material and suggestions to the teacher for further exploration of the insect world. Young "entomologists" went on Saturday field trips and insect collecting expeditions and learned to use sophisticated equipment to study, preserve and mount their collections. The culmination each year was a Field Day for all classes together at the college. In 1984 600 students participated in lecture demonstrations and field trips.

Insect Handbook In response to general demand and need, a major emphasis most recently was the completion of a 50-page profusely illustrated booklet entitled *Island Insects* -

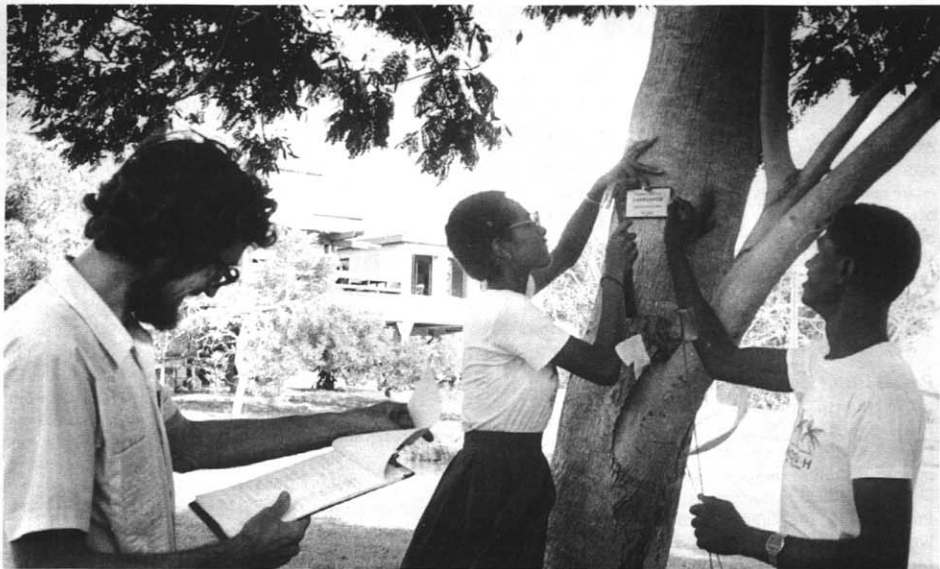
A Handbook for Insect Study. Intended as a tool for educators of local young people, the handbook covers insect classification, collecting, pinning, preserving, identifying and rearing. Its

popularity was attested by the fact that parents and other residents also sought out the book for themselves and their children.

MAJOR PESTICIDE CATEGORIES
AND RETAIL OUTLETS ON ST. CROIX 1983

DISTRIBUTOR/LOCATION	Fungicides (Plant Diseases)	Herbicides (Weeds)	Insecticides (Insects)	Livestock & Pet Pesticides	Miticides (Mites)	Molluscicides (Snails & Slugs)	Rodenticides (Rats & Mice)	Soil Fumigants
Caribe Home Center - Sunny Isle		●						
C & W Hardware - Hannah's Rest	●	●	●	●	●	●	●	●
Cruzan Gardens - Calquohoun	●	●	●	●	●	●	●	●
Gannet Hardware - Gallow's Bay	●	●	●	●	●	●	●	●
Gi Gi Pet Shop - Sion Farm Shopping Center			●	●				
Grange Hill Nursery - Centerline Rd. Est. Orange	●	●	●	●	●	●	●	●
Grand Union - Sunny Isle	●	●	●	●	●	●	●	●
HMS Inc. - Gallow's Bay		●	●	●	●	●	●	●
Merwin Hardware - La Grande Princesse	●	●	●	●	●	●	●	●
Pat Logan's Pet Store - Sunny Isle		●	●	●	●	●	●	●
Pueblo - Golden Rock	●	●	●	●	●	●	●	●
Pueblo - Ville la Reine	●	●	●	●	●	●	●	●
St. George Botanical Garden - Est. St. George	●	●	●	●	●	●	●	●
Tool Box - North Shore Rd. Est. Concordia	●	●	●	●	●	●	●	●
V.I. Dept. of Agriculture - Centerline Rd. Est. Lower Love	●	●	●	●	●	●	●	●
Woolworth's Department Store - Sunny Isle			●	●	●	●	●	●
Ye Old Feed Shoppe - Peter's Rest		●	●	●	●	●	●	●

This chart was prepared by the Cooperative Extension Service Pest Management Program at CVI after a survey of 140 St. Croix outlets. The 17 distributors listed carry one or more of the 8 categories of non-aerosol pesticides for use outside the home.



More than 150 plants on the St. Thomas and St. Croix campuses were identified and labeled as part of the Natural History program.

OUR NATURAL RESOURCES

Given the severe competition for limited natural resources (NR) in the Virgin Islands, the Cooperative Extension Service has begun to address public education issues in natural resources management and to serve in an advisory capacity regarding natural resources issues. With a population density of about 1000 persons/square mile, the Virgin Islands rank among the top in terms of human impact. Less than one-third of the land surface remains minimally developed. The shoreline-to-land ratio is very high, and the coastal zone interface is a prominent element of NR concern. Steep slopes and land clearance cause serious erosion. More indigenous species of plants grow in the V.I. per unit area than anywhere in the 49 continental U.S. states.

Endangered Species Of the 800 to 1000 naturalized or indigenous plants, at least 10 are considered endangered

and recent work has brought to light five more probably endemic species thought to be new to science, which also appear to be endangered. At least one lizard and one native bird are also threatened with extinction. There is very little public awareness about the importance of our natural resources, and since jobs are scarce on the islands, any suggestion that the environment take precedent over building and land development is tantamount to heresy.

Working with Other Agencies

Direct intercession and enhancement of public knowledge about the importance of a balanced ecology in a fragile island ecosystem are the two routes towards approaching the problem of the endangered environment. One method has been to work with other agencies in enhancing public knowledge of the flora of the Virgin Islands including the National Park Service

and Environmental Education Program of the V.I. Department of Education. There have been some positive preliminary results. The Nature Conservancy obtained land in one water shed that was about to be developed which contained two endangered plant species. An endangered species was located on the site of the proposed solid waste recovery plant and plans were modified so as not to disturb it. Two nurseries are now propagating and offering native plants for sale and three hotels have increased the number of native plants on their grounds. However, public awareness must still be increased to the point that residents serve as protectors of their environment against the haphazard rezoning and encroachment of poorly planned development. The extension service is being recognized as a source of expert information on terrestrial flora and other natural resources. Col-

laboration has increased with the National Park Service on St. Croix and St. John, the V.I. Planning Office and the V.I. departments of Agriculture, Education, and Conservation and Cultural Affairs. Local offices of the Forest Service, Soil Conservation Service, real estate firms and nurserymen have also been involved. Recently extension was invited to become a member of the V.I. Resources Management Cooperative, to which 13 regional NR agencies belong.

Project VIBIB Another major activity of NR management information is related to assessing the current state of knowledge pertaining to resources management in the islands. This is being accomplished in conjunction with Project VIBIB, the Virgin Islands bibliography project, with responsibility for all science materials under the extension NR program auspices. Major support for this effort is being provided by the Man and Biosphere Program via the National Park Service. This work is due to be published in three volumes sometime in 1986.

Campus Plants Labeled As a public service, more than 100 plants on the St. Thomas college campus and over 50 plants on the St. Croix campus have been properly identified and labeled with durable aluminum plaques to

serve as an informal botanical "course" for college visitors, students and staff. Maps have also been prepared and guide booklets are being developed.

St. Thomas-St. John Projects The Natural Resources program is currently working with three major land development projects on St. Thomas and St. John to insure the preservation of endangered species of plants and reduce environmental damage. The projects include Fish Bay, St. John (Cocoloba Development), Frenchman's Bay, St. Thomas (Green Cay Development), and Stalley Bay, St. Thomas (Waste Recovery Project). A total of four endangered plant species are reported from those areas alone. The plants considered endangered are *Tillandsia lineatispica*, *Erythrina eggersii*, *Zanthoxylum thomasianum* and *Calyptranthes thomasiana*. Fruits and flowers were collected from four varieties of plants which may be new species. They include *Malpighia* sp., *Eugenia* sp., *Psidium* sp., and *Byrsonima* sp. Specimens were sent to the Smithsonian Institute and the New York Botanical Garden for evaluation. Attempts are being made by extension to propagate these species.

Initial steps were taken to implement a collaborative project on forest succession on St. John. The principals involved are the extension service, National Park Service and New York Botanical Garden. Forest recovery after clearcutting, slash and burn, agricul-

tural exploitation and soil erosion is being examined. The National Park Service provided a \$10,000 grant to the extension service to participate in the project.

Other Outreach In other NR outreach, the program assisted the V.I. Chamber of Commerce and R.A.R.E. Inc. (World Wildlife Fund) in the development of educational programming in the Salt River Bay area which was designed for media use and information for tourists essentially, and is now being used by the St. Croix Taxi Association. An agro-forestry project involving the improvement of 25 acres of highly visible land with desirable tree species at Martin Marietta was advised by the natural resources program from its inception. Another National Park Service grant was received to develop a list of terrestrial invertebrates of St. John and other islands, with biologist Dr. William Muchmore spending one month working on the project in its final stage. Dr. George Proctor, Puerto Rico University Department of Natural Resources, was assisted by the extension NR staff while in the islands collecting botanical specimens which were contributed to the extension herbarium collection. At least 120 species of plants have been added to the herbaria of both St. Croix and St. Thomas, with the chief focus on collections of grasses, crops, legumes and endangered species.



In cooperation with V.I. Legal Services and the St. Croix Farmers Cooperative Association (FCA) a two-day seminar was sponsored by CRD. Fisherman Joseph Laplace, CRD Economist George Morris, Legal Services attorney Allison Thompson and FCA president Clayton Richards led the seminar.

THE ADVISORY ROLE OF CRD

The Community Resource Development program (CRD) has as its goal the improvement of community life for islanders. While the other programs of Extension are more specifically oriented towards their own clients, such as youth, homemakers, farmers or gardeners, CRD and its program embraces everyone. Whether it is in one-to-one assist role or with a seminar or a factsheet, CRD reaches out to fill a specific need through its advisory capacity in many fields.

Enterprise Budgets In 1983 the CRD program began to develop a series of agricultural enterprise budgets made available to the general public covering production of goats, cassava, cucumber, eggplant, avocado, mango, pepper, sorrel, banana and limes. Variable and fixed costs were outlined in detail to show the difference in types of input used in the production

process. Extension has received repeated requests for such information over the years, particularly from beginning or novice farmers or gardeners. A farm management factsheet on essential farm financial records and types of accounting methods was also brought out to assist the farmer in the essentials of good business.

CRD's Advisory Role Numerous presentations, seminars and workshops were conducted throughout the 1983 and 1984 period to augment agricultural development in the islands and to serve in an advisory capacity to other governmental agencies. Extension staff served on the Technical Advisory Board for the V.I. Planning Office's Long Range Plan and worked closely with their Community Block Grant Development sector and their Historic Preservation program. St. Thomas Extension personnel also served in a

technical advisory capacity for the Education Department's I.C.E. program and as members of "The Project: St. John" steering committee to provide agricultural assistance and help in establishing a viable youth training program in agriculture on the Hammer Farm site. Also on St. Thomas, the CRD program worked closely in an advisory capacity with the St. Thomas-St. John Farmers Association, the St. Thomas Livestock Association, the Hibiscus Society, UJAMAA Organic Gardens, Bordeaux All-For-The-Better, and the St. Thomas Garden Club in developing a legislative program for the improvement of agriculture in the Virgin Islands. Presentations were also made for some 75 Upward Bound Students during their Career Day where they learned of career opportunities in agriculture, natural resources and home economics.

Helping Farmers CRD assisted the newly developed St. Croix Farmers Cooperative Association (FCA) meet its legal requirements of incorporation in 1983, and in 1984 rendered technical assistance to FCA in areas of planning, organization, education on cooperatives, and marketing; six farmers were also aided in preparing farm plans and FmHA loan applications. Assistance was provided to the Emergency Board of the Agriculture Stabilization Service in compiling and analyzing recommended procedures that could reduce the damaging effects of future drought conditions on local livestock producers who wished to acquire emergency drought relief funds. In a joint effort with the FCA and the V.I. Legal Services, CRD sponsored a two-day education seminar for 25 persons on Agricultural Cooperative Development. The chief focus was to educate local producers on structures of cooperatives including types, laws, financing and management. In November of 1983, a farm financial

seminar was conducted for 20 farmers. The emphasis was on procedures for completing farm financial statements which included income statement, balance sheet, cash flow statement, farm credit and real estate loans. Working with the Integrated Pest Management program, CRD prepared a cost comparative study of weed control methods for farmers. In this study the cost of controlling weed growth by using a combination of herbicides and manual weeding was compared to the cost of using only manual weeding. It was found that the labor cost of manual weeding alone was 65% greater than if chemicals were used.

Preparing Youth For The Future

A major extension role is to assist young people with future career choices. A presentation by CRD to over 700 students at Alexander Henderson School Career Day outlined the various possible career fields in agricultural economics and rural development. In May 1984 a presenta-

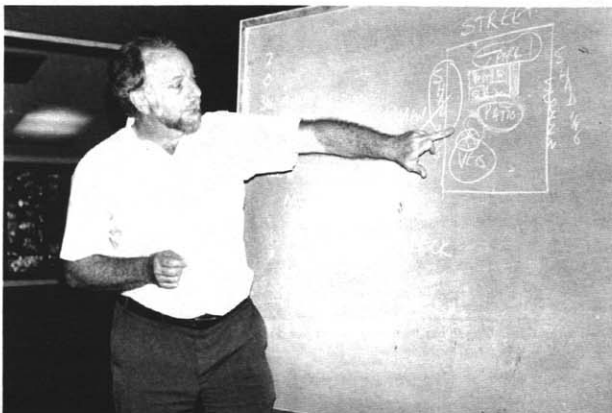
tion on farm financial management and agricultural marketing was conducted for 120 students at the John H. Woodson School in conjunction with the 4-H Youth program. The students were familiarized with the basic concepts and tools for effective farm financial recordkeeping practices. They were also introduced to modern retail marketing techniques for fruit and vegetable crops. In June, again working with the 4-H program, CRD produced a seminar on agricultural marketing and careers in agricultural economics for 25 summer students employed by the Department of Education. In July a workshop on researching and development of careers was conducted for 40 teenagers in the 4-H Camp Apprenticeship program. The young people learned about educational requirements, employment opportunities, possibilities for advancement and potential earnings associated with fields in which they were interested.

"SOMETHING FOR EVERYONE"

Extension Home Economics means different things to different people, but an apt summation of the high regard felt for this program is a statement overheard at last year's Agriculture and Food Fair. As two women paused at the entrance to the colorful Home Ec exhibit, one remarked to the other, "What I like about this program is that there is something for everyone to get involved in." This was no exaggeration. Beginning with teenagers who attended the Summer Teens program for six weeks and completing the chronological spectrum to include senior citizens at Aldersville, with all kinds of programs in-between, the Virgin Islands Extension Home Economics component is a true example of extension at its best, with new projects and programs cropping up as the community need is felt. It is this flexibility which provides the dynamics of most extension programming.

New Programs Among the new programs conducted by Home Economics was a popular Babysitting Course to familiarize not only teenagers but also mature adults with various aspects of child care. Babysitting attracted 18 participants the first year, 24 the second year, and expanded into an Adult Sitter Clinic for 54 mature persons. The latter were instructed in how to properly care for the elderly and other dependent adults by 22 professionals from various fields, such as doctors and nurses, who volunteered to share their expertise with participants.

For All Ages Our older citizens were not forgotten: classes in sewing and crafts were offered and during the month of May (Senior Citizens Month) 120 seniors attended Nutrition Workshops held at five senior citizen centers on St. Croix. The culmination was a special Senior Citizen Celebration held



Housing specialist Dr. Joseph Wysocki of Penn State University gave a seminar on home planning and layout.



First group of babysitters qualifying for certification after Extension Home Economics classes are congratulated by program leader Olivia Henry.



The Summer Teens six weeks program attracted 85 young people in 1984 who learned to construct their own garments as well as to prepare food properly and develop skills in arts and crafts.



Adult Sitter Clinic offered instruction to 50 mature persons in how to care for elderly and other dependent adults.



Certification for completion of many courses such as Sewing for Senior Citizens was a popular occasion as shown at this ceremony presided over by program aide Hope Murphy (left) with CRD program leader and assistant extension director Kwame Garcia doing the honors.



Home beautification on a budget featured decorator Judy Patalidis (center) demonstrating imaginative uses for fabrics.

in the Home Economics Laboratory on the College Campus. Since the trend is now firmly established that usually both heads of households are employed outside the home, often we find retirees among the participants in daytime home economics classes; they now have the interest and the time to improve their skills in sewing for the home, clothing construction or crafts. There were 309 participants in these free classes which included home beautification, clothing recycling and a Christmas Decoration Workshop. Two Creative Cooking courses were conducted with an enrollment of 16. The main objectives were to stimulate interest in utilizing available foods with which to create new and tasty recipes for family meals, and also to develop skills in preparing bulk cookery. A Head of Household energy conservation workshop was also held in cooperation with the V.I. Energy Office. The emphasis was on educating householders about the energy crisis with tips on how to get the most energy for the least expenditure.

EFNEP Grows The federally funded Expanded Food and Nutrition Education Program (EFNEP) showed increases in young Virgin Islands' clientele, with a jump from 18 to 50 enrolled in 1983, to 124 in 1984. In addition, 304 homemakers received nutrition information through the Nutrition Outreach Program. An EFNEP Bake-Off Contest was held for 15 contestants with prizes awarded for the best baked goods. Twenty-six students at the Alfredo Andrews School were enrolled in an Extension Home Economics class during the 1984 Spring semester; youngsters learned about nutrition and food preparation, clothing construction and crafts.

Summer Teens In 1983 the Summer Teens Program attracted 54 young people and in 1984 the program was expanded to all three islands with an enrollment of 85. These teenagers 13



Visiting U.S. Department of Agriculture dignitaries at the Food Procurement Workshop co-sponsored by the Cooperative Extension Service of the college gathered for the opening of the workshop. With them seated from left are V.I. Agriculture Commissioner Patrick N. Williams; CVI Extension Service director Dr. Darshan S. Padda; Home Economics program leader Mrs. Olivia Henry.



Learning about simple home repairs can save money, explains electrician Evanor Gibs to homemakers at Extension.



The guava is a fruit of many uses. Extension Aide Agatha Ross demonstrates all the good things made from local guava, such as preserves, juice, pies and "leather" candy.



Clothing Construction includes learning how to sew from a pattern.



Two creative cooking courses were held for those who wished to explore tasty new cooking methods.

to 15 years old were involved in a wide variety of personal growth activities covering learning how to sew their own outfits, the importance of good nutrition and food preparation, crocheting, embroidery work and other arts and crafts. Culminating this popular summer youth activity was the Sixth Annual Achievement Ceremony for the teens and 125 adults who all received certificates for successfully completing various program achievements.



The Virgin Islands had a winner when Mrs. Olive Henderson of Estate Whim and her family were proclaimed "Great American Family of 1982," in December of that year. The award, signed by Mrs. Ronald Reagan, the President's wife, cited Mrs. Henderson, mother of five foster children, as having made a contribution to improve her community and strengthen America. A member of St. Paul's Anglican Church, the Civic Club, Business and Professional Women's Club and a 4-H volunteer, Mrs. Henderson is shown being congratulated by the Governor's administrative assistant for Frederiksted Teofilio Espinosa.

Advisory Council A Home Economics Advisory Council was formed comprising five members. The Council gives input and advice on community needs which can be met by the Home Economics component. Combined housing and gardening workshops were held over a two-day period which featured a professional housing specialist from Penn State University and an horticulturist from the University of Florida.



Receiving the gavel from Home Ec program leader Olivia Henry was new Homemakers Council president Marjorie Tyson, while agent Dorothy Gibbs looks on.

Food Procurement Workshop What was referred to as the "best workshop ever" covered a four-day period in February 1984 and attracted hundreds of participants. The Food Procurement Workshop was presented jointly by the Home Economics program and the U.S. Department of Agriculture. Eight representatives of USDA along with a score of representatives from mainland and local agencies, as well as food businesses all spoke to the 100 persons who attended each day's sessions. Participants represented government and private business industries who deal with food, including school, hospital and elderly food programs along with food producers, wholesalers and retailers. A major highlight of the workshop was the appearance of Dr. Joan S. Wallace, USDA's administrator for the Office of International Cooperation and Development. Special commendation certificates for those attending all four days of the workshop were awarded to 37 individuals.



Gathered together for a "family" picture are these new members of the V.I. Homemakers Council.

INVOLVING THE YOUTH

New 4-H Programs Virgin Islands young people, like youth all over, respond to the challenge of being involved in imaginative activities, particularly in a social setting where they meet with their own peers. Many of the activities promoted by the extension 4-H Youth Program appeal to this aspect and need in the islands' young people. Several new programs emerged in 1983-1984 in addition to those that are ongoing. Included among these is a special interest group called Musical Youth at St. Patrick's School in Fredriksted involving 90 youth and five teachers. They have given public performances at 4-H affairs and appeared in the opening ceremonies at the Annual Agriculture and Food Fair. A new 4-H Wildlife Program has as its main emphasis the rearing of pigeons. The program involves eight members and 143 pigeons. The Youth Garden Program originally was oriented towards junior and senior high school aged children, but in 1984 it took on a new look with participants as young as eight-years old involved in raising their own crops. During the year three schools, one youth group and an in-

dividual group participated in two gardening workshops to learn about soil, pest management, food processing and marketing and general gardening from extension technical staff. The Animal Husbandry Program focused on projects with heifer and bull calves, rabbits and goat rearing. All groups bent their best efforts toward achieving recognition and ribbons at the Annual Agriculture and Food Fair held each February on St. Croix.

4-H Clubs The club system is the backbone of the 4-H program. Made up of one or more volunteer leaders and at least five interested youth, club projects are chosen by each club and can vary according to participants' interest area. Currently there are four clubs on St. Thomas, three on St. John and 25 on St. Croix. While many clubs have varied interests, the focus of others is directed towards gardening, animal husbandry, home economics and sewing, arts and crafts, music, agriculture, woodworking, culture awareness, dairy, wildlife and natural resources. There are also special interest groups which meet for one

specific purpose such as animal husbandry, Expanded Food and Nutrition (EFNEP), music education, youth gardens and wildlife-natural resources.

Outside Exposure As important as the youth programs, are the training sessions offered for adult volunteers. A highlight each October is Rock Eagle Conference in Georgia. These annual leadership training meetings usually involve volunteer leaders and 4-H staff members. Partial funding for travel expenses has been received from J.C. Penney Company. April is the month for National 4-H Conference held just outside Washington, D.C. which sees our six delegate 4-H'ers and two staffers join with hundreds of other delegates across the nation. "Inspiring" is the one word they have chosen to describe their national experience. Part of this has meant learning about new program ideas, making new friends from all over the U.S.A., exchanging state mementos and learning about other parts of the world. In 1983 a major highlight occurred for the V.I. delegation when the Virgin Islands ex-



A 4-H highlight annually is the visit by selected delegates to the National 4-H Convention. The 1984 group visiting V.I. Delegate to Congress Ron deLugo while in Washington, D.C. were 4-H Agent Shelton Shutterbrandt, 4-H Aide Yvonne Phillips, volunteer leader Gwendolyn Molloy, 4-H'er Tessa Alexander, delegate deLugo, 4-H'ers Lorraine Simon, Lucy Boodoosingh and Peter Christian.



Cooperation is the name of the game, especially when three legs must go in the same direction as four! The event was 4-H Sports Field Day.



4-H has celebrated World Food Day during its annual 4-H week observance in October with a large display and free recipe books offered at Christiansted Market Place. In 1982 they featured coconut and papaya.



Annual Awards night in October recognizes top 4-H'ers, volunteers and community backers of 4-H.



The 4-H Mask and Lantern Parade is an old traditional event recently resurrected as an annual signal of Christmas festivities by Extension 4-H.

hibit was voted among the top five at the conference. Later, in June, three 4-H'ers and one staff member attended Michigan Exploration Days in East Lansing. Delegates were exposed to more than 120 career options. After the three-day conference, delegates spent two weeks with Michigan host families in a cultural exchange. Another new program which has proven successful for 4-H is Staff Orientation conducted at the beginning of each fiscal year to provide 4-H with continuing meaningful direction, increasing emphasis on leaders' training and streamlining the 4-H Advisory Council. Leaders assisted by staff also participated in arts and crafts fairs held at Island Center and Sunny Isle during the early spring.

Annual 4-H Week The second week of October is always Virgin Islands 4-H Week. It is at this time that 4-H opens its doors to the public, and through a variety of colorful programs, encourages the increased participation of island youth and adult volunteers. Since national World Food Day also occurs at the same time, it has proven to be an excellent opportunity for 4-H to focus on food that can be grown locally. Each year 4-H mounts a large display in the Christiansted marketplace centering around one specific crop, such as papaya, coconut or breadfruit. Emphasizing local fruit trees, the virtues of guava as a versatile fruit were extolled via public service TV presentations by 4-H youngsters. The many various ways to serve these local foods were demonstrated to the public, with samples offered to bystanders and recipe books compiled by 4-H given out free. Other activities during 4-H Week include Arbor day with the planting of a native fruit tree on each of the three Virgin Islands; Open House which introduces former 4-H members and leaders as honored guests; and Storytime for island youngsters "under the tamun tree" with famous local storytellers remind-



The summer Apprenticeship Program placed many young people in jobs throughout the community. Here Lyria Samuel learns to use a National Guard computer assisted by Andrea Bryan.



"Just like in TV," young apprentices learned the art of fingerprinting while working at Public Safety.

ing listeners of the adventures of Bru Nancee, or telling scary jumbec stories that are guaranteed positively true! Often 4-H Week closes with an Awards Ceremony to recognize the top 4-H members and volunteers. A total of 320 took part in the week-long activities in 1983.

Mask and Lantern In its efforts to encourage traditional culture in the Virgin Islands, on St. Croix each year at Christmastime the 4-H sponsors an old time Mask and Lantern parade. In both 1982 and 1983 more than 120 4-H'ers and the public participated by showing skills in mask and costume making, utilizing natural resources.

Many prizes, including trips to Puerto Rico and St. Thomas, were awarded to winners who displayed excellent creative skills in their unusual masks and decorated lanterns. On St. Thomas 4-H'ers held a carol sing for senior citizens at Lucinda Millin Home and at the Senior Citizens Center.



Arbor Day is important to 4-H with emphasis placed on planting fruit trees in the V.I. like this mango at Woodson School.



Veterinarian training includes washing wiggly dogs, as these two 4-H apprentices learned at Crago Animal Clinic.

EFNEP The Expanded Food and Nutrition Education Program (EFNEP) was begun in the schools in January 1983. Nutritional information on the Basic Four food groups was presented to 142 students from three schools and two 4-H clubs. Interest was keen, and principals, teachers and students requested that the program be repeated the next year. From a September 1983 total of 165 enrolled in EFNEP, due to its popularity enrollment increased to 240 young people by the end of September 1984, including 19 family groups.

Summer Camp The 4-H Summer Camp program was funded exclusively by extension resources in both 1983 and 1984. In 1983 11 counselors were hired to oversee activities at three campsites on St. Croix and one each on St. Thomas and St. John for a total of 118 young campers. In an innovative approach, each campsite offered a special activity theme: drama, sea environment, teen apprenticeship and cultural awareness. More than 45 community leaders and specialists participated as guest speakers the first year. The teen apprenticeship program has had the wholehearted cooperation of businessmen and agency heads. In 1983 15 sites provided actual working experience three days a week. The other two days teen campers learned skills in resume writing, interview role playing, research and presentation. In Sea Environment, campers were taught swimming by lifeguards at Vincent Mason Pool in Frederiksted, as well as learning fish identification, cooking methods for different types of fish and shell collecting-identification. The season ended with drama presentations, field days, crafts displays and ceremonies on all three islands.

Summer camp opened on June 25 and ran through August 10 in 1984. There was a total of 133 campers enrolled on all three islands. Staff included 12 counselors, four legislature-

funded volunteers and three others. Camps specialized in theatre, sea environment and teen apprenticeship. The latter totaling 40, were employed at 17 different private and public sector jobs, and were widely acclaimed by those for whom they worked for their aptitude and serious intent. Final summer activities included an enthusiastic and often times uproarious field day, theatrical presentations and crowning of Miss and Mr. 4-H at the Awards Ceremony.



Some 4-H'ers were interested in learning about sewing a new wardrobe with 4-H Assistant Beulah Thompson providing the instruction.



Summer Royalty chosen during closing ceremonies of 4-H camp proudly display their finery.



Sea Environment Camp in Frederiksted attracted a large group of water lovers.

HONORS, MEETINGS, VISITORS AND FAIRS



Delegates to the 20th Annual Caribbean Food Crops Society (CFCS) meeting held on St. Croix were greeted by this cheerful foursome from Extension Service and Agriculture Department.



Passing the gavel, Dr. Darshan S. Padda relinquishes his 1984 presidency of Caribbean Food Crops Society to newly elected president Dr. St. Clair Forde of Trinidad.

Distinguished Service Award In May 1983 the staff of CVI's Land-Grant programs celebrated the announcement that Director Darshan S. Padda had been chosen to receive the U.S. Department of Agriculture's highest honor, the prestigious Distinguished Service Award. Agriculture Secretary John R. Block, in presenting the award, stated that Dr. Padda was recognized for his leadership in developing and conducting extension education programs that serve as models for technology transfer systems not only in the Caribbean region but also for other developing countries in the world.

Caribbean Food Crops Society In September 1983 Dr. Padda was elected president of the Caribbean Food Crops Society at the 19th annual meeting held in Puerto Rico. The twentieth annual meeting of the Society took place in October 1984 and was considered a most successful international gathering of professionals involved in the production and distribution of food crops in the Caribbean Basin. By far the largest conference ever sponsored by the Society, some 225 participants were officially registered, with the total attendance well over 300 including spouses and unregistered local participants.

The program included 133 papers presented in concurrent technical sessions held at the Hotel-on-the-Cay convention site in Christiansted Harbor. Delegates represented 23 nations and territories, including Antigua, Barbados, Bermuda, Columbia, Costa Rica, Dominica, Dominican Republic, French Guiana, Grenada, Guadeloupe, Guyana, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, St. Lucia, St. Vincent, Trinidad-Tobago, U.S.A., U.S. Virgin Islands and Venezuela. Translation into English, French and Spanish was simultaneous when needed.



Interest was expressed in learning more about Soil Solarization as explained by plant pathologist Rob Webb.



EFNEP display at Home Economics booth caused much attention with children who loved the big EFNEP dolly. Extension assistant Evannie Jeremiah was in charge.



AT THE FAIR

St. Thomas Extension Coordinator John Matuszak checks out some billboard displays at CFCS meeting.



Poisonous plants as well as beetles, bugs and butterflies were displayed by pest management at Agriculture and Food Fair.



Dr. Joan S. Wallace, administrator for the U.S. Department of Agriculture's Office of International Cooperation and Development was featured speaker at the 1984 Agriculture and Food Fair. Dr. Wallace gave a keynote address to those assembled for the Food Procurement Workshop just prior to the fair.

Visitors . . . Several mainland groups and individuals were hosted by the Land-Grant programs in the Virgin Islands. In March 1983 the annual meeting of the Caribbean Basin Administrative Group (CBAG) for Tropical Agriculture was held on St. Thomas to review research proposals and fund allocations. CVI's Agricultural Experiment Station received approval for three projects with an annual funding of \$159,900 at that time. Special staff member for the Rockefeller Foundation Dr. E. J. Wellhousen, who is a world renowned agricultural scientist, visited St. Croix in April as part of the UNICA-BID mission to learn more about the Caribbean agricultural production, research, education and technology transfer. In September, 12 members of the International Science and Education Council (ISEC) research committee visited St. Croix enroute to the Caribbean Agricultural Research and Development Institute (CARDI) in Trinidad. Director Darshan Padda hosted them during their stay, with a visit also to various Land-Grant facilities and a breakfast meeting with CVI President Arthur A. Richards.

. . . and Meetings The following April the annual meeting of the Southern Extension Directors was held on St. Thomas at the Virgin Islands Hotel with representatives of 11 states attending. A highlight of the meeting, which was to decide regional and national policies affecting extension programs in the southern region, was the presence of both Dr. Mary Nell Greenwood, USDA's Extension Service Administrator, and Dr. Howard G. Diesslin, executive director for extension of the National Association of State Universities and Land-Grant Colleges (NASULGC). The annual meeting of the Southern Region Cooperative Research Project S-168 for Warmwater Aquaculture was co-hosted by the CVI Agricultural Experiment Station and the University of Puerto Rico at Mayaguez. On



Pausing for a moment prior to CFCS Banquet were from left CVI president Arthur A. Richards, keynote speaker USDA's Assistant Secretary for Science and Education Dr. Orville G. Bentley and CFCS president Darshan S. Padda.



Newly organized Caribbean Aquaculture Association met concurrently with the Caribbean Food Crops Society.



Southern Extension Directors met with the CVI extension service on St. Thomas in 1983 for annual meeting.



Dr. Mary Nell Greenwood, USDA's Administrator of Extension, paused for refreshments at Southern Directors meeting and was joined by extension aides Amabell Frett and Alma Wesselhoft and agent Irene Gibson.



St. Lucia Minister of Agriculture Ira d'Auvergne (center), visited with Land-Grant director Darshan S. Padda, along with local businessman Silm Frances (left).

June 21 the group of 19 participants representing 10 research institutions and the USDA visited aquaculture research facilities on St. Croix. The first biennial meeting of the newly formed Caribbean Aquaculture Association was also held October 1984 in conjunction with the Caribbean Food Crops Society meeting, and was attended by 15 aquaculturists, several of whom delivered papers to those attending the food crops meeting.



Dr. A. J. Oakes, author of *Poisonous and Injurious Plants of the Virgin Islands* which was reprinted by the CVI Extension Service, visits the Extension Resource Room with his wife, Mae, to pick up a few copies of the booklet. With them is pest management agent Olasee Davis.

Eastern Caribbean Center Representatives from the experiment station and extension service professional staff joined with others at the college to assist with preliminary recommendations and plans creating an Eastern Caribbean Center at CVI. The Center is planned to be an international educational institution fully integrated into the College of the Virgin Islands in order to offer cooperative programs of study, research and training for the people of the Eastern Caribbean region. The Cooperative Extension Service, with its many outreach capabilities which have proven so successful, has announced its willingness to assist others beyond the territorial shores, as it has in the past through such services as soil and water analysis and cultural youth exchange programs.

Agriculture Fairs In 1983, despite a late start, the extension service joined with the V.I. Department of Agriculture in presenting a modified agriculture fair called an "Agriculture Exposition," with most of the displays and activities taking place in the main exhibits building at Estate Lower Love on St. Croix. Both the extension service and experiment station mounted handsome exhibits, with 4-H awarded first prize in the youth division. The following year, the traditional fair was again held in February and Land-Grant programs featured large displays on everything from trickle irrigation to 4-H masks, with both Home Economics and 4-H again taking top awards for their colorful exhibits. In addition to entertaining the crowd with the 4-H Musical Youth group, another 4-H innovation was the selection of the first youth gardener of the year as a result of the youth garden program. A donation of \$200 was given by Martin Marietta towards the prizes in the gardening competition. Some 22,000 persons attended the three-day 1984 fair on St. Croix while on St. Thomas that year more than 5,000 persons were attracted to their annual fair held at the CVI gymnasium for one day in March. As in the previous year, exhibits included those from extension home economics, 4-H, agriculture, pest management and small livestock. Joining with them were the colorful blossoms of the St. Thomas Hibiscus Society.



Congratulations were in order for the first Associate of Arts graduate in agriculture Charles Collingwood (center). With him are Dr. Mary Savage, St. Croix Campus administrator, agriculture instruction coordinator Arthur Petersen, his mother Mrs. Collingwood, and Land-Grant director Darshan S. Padda.



Members of the International Science and Education Council (ISEC) of USDA met in September on St. Croix enroute to CARDI meeting in Trinidad. They are shown with Dr. Arthur Richards and Dr. Darshan Padda who showed them Land Grant facilities at CVI.

ADVISORY COMMITTEES - 1983-84

Extension
 Germaine Cherry
 Mario Gasperi
 Oscar Henry
 Agatha Ross

Home Economics
 Otis Hicks
 Michele Thurland
 Hilda Todman
 Rosalie Jones

4-H
 Theodore Thomas
 Sam Thomas
 Antonio Steele
 Nicholas Castruccio
 Maude Christian



Martin Luther King's Birthday was commemorated in January 1984 with the planting of a mango tree. Wielding shovels are Agriculture Commissioner Patrick N. Williams and Land-Grant programs director Darshan S. Padda.



Dr. Harold Hupp carefully checks ears of calf during judging at the Agriculture and Food Fair.

STAFF 1983 and 1984

ADMINISTRATION

Darshan S. Padda	<i>Director, AES-CES</i>
*Harold Hupp	<i>Assistant Director (AES)</i>
Kwame Garcia	<i>Assistant Director (CES)</i>
Bonnie Andrews	<i>Administrative Assistant</i>

AGRICULTURAL EXPERIMENT STATION

ANIMAL SCIENCE

*Harold Hupp	<i>Animal Scientist</i>
Douglas Wright	<i>Research Technician II</i>
Audrey Valmont	<i>Research Technician I</i>
Yvonne Horton	<i>Secretary II</i>

AQUACULTURE

James Rakocy	<i>Research Aquaculturist</i>
Ayyappan Nair	<i>Assistant Aquaculturist</i>
John Hargreaves	<i>Research Technician I</i>
Vernon Smith	<i>Research Aide</i>

PLANT SCIENCE

*Ahmed Hegab	<i>Research Agronomist</i>
Arthur C. Petersen	<i>Vegetable Crop Specialist</i>
Christopher Ramcharan	<i>Associate Horticulturist</i>
Stephan Buzdugan	<i>Irrigation Specialist</i>
Agenol Gonzalez	<i>Research Specialist</i>
Robert Webb	<i>Research Specialist</i>
Walter I. Knausenberger	<i>Pest Management Specialist</i>
*Eric Dillingham	<i>Farm Manager</i>
Albion Francis	<i>Research Assistant II</i>
Mary Gozelski	<i>Research Assistant II</i>
Kirk Benoit	<i>Research Assistant II</i>
Lisa Yntema	<i>Research Technician I</i>
Nelson Benitez	<i>Research Aide</i>
Ezekiel Clark	<i>Research Aide</i>
Ramiro Gomez	<i>Research Aide</i>
Jeremiah Hassan	<i>Research Aide</i>
Oswaldo Lopez	<i>Research Aide</i>
*Alejandro Perez	<i>Research Aide</i>
*Estanislao Perez	<i>Research Aide</i>
Kendall Petersen	<i>Research Aide</i>
*Narciso Rivera	<i>Research Aide</i>
Antonio Rodriguez	<i>Research Aide</i>
Augustin Ruiz	<i>Research Aide</i>
Coreen Hughes	<i>Secretary</i>

COOPERATIVE EXTENSION SERVICE

AGRICULTURE

David Farrar	<i>Program Leader</i>
Clinton George	<i>Extension Specialist - Horticulture</i>
*Harold Hupp	<i>Animal Scientist</i>
Paul Boating	<i>Small Livestock Specialist</i>
Charles Smith	<i>Extension Assistant II</i>
Allan Schuster	<i>Dairy Assistant II</i>
Alf Smith	<i>Extension Aide I</i>
Romelia Camacho-Nanton	<i>Secretary I</i>

COMMUNITY RESOURCE DEVELOPMENT

Kwame Garcia	<i>Program Leader</i>
*George Morris	<i>Extension Specialist</i>
Liz Wilson	<i>Communications - Editor</i>
Randall Macedon	<i>Extension Agent I</i>
Lawrence Sarauw	<i>Extension Aide II</i>
*Olonzo Williams	<i>Extension Aide II</i>
*Nullister DeWese	<i>Extension Aide II</i>
Jean Cook	<i>Secretary II</i>

PEST MANAGEMENT

Walter I. Knausenberger	<i>Program Leader</i>
G. Houston Holder	<i>Plant Protection Specialist</i>
*Marti Terry	<i>Extension Agent I</i>
Kenneth Davis	<i>Extension Agent I</i>
Christene Henry	<i>Office Assistant II</i>

HOME ECONOMICS

Olivia Henry	<i>Program Leader</i>
*Bernice Jacobs	<i>Extension Assistant II</i>
Evannie E. Jeremiah	<i>Extension Assistant II</i>
*Doris Edwards	<i>Extension Assistant II</i>
Dorothy Gibbs	<i>Extension Assistant II</i>
Miriam Greene	<i>Extension Aide II</i>
*Angela Lake	<i>Extension Aide II</i>
Hope Murphy	<i>Extension Aide II</i>
Rosalind Browne	<i>Extension Aide I</i>

4-H

Zoraida E. Jacobs	<i>Program Leader</i>
Shelton Shulterbrandt	<i>Extension Agent I</i>
Sarah Dahl-Smith	<i>Extension Agent I</i>
Jillian C. Webster	<i>Extension Assistant I</i>
James Weeks	<i>Extension Assistant I</i>
Beulah Thompson	<i>Extension Assistant I</i>
Alejandro Bolques	<i>Extension Assistant I</i>
*Leroy James	<i>Extension Aide I</i>
Lillian Elliott	<i>Secretary I</i>

ST. THOMAS - ST. JOHN

John Matuszak	<i>Extension Coordinator</i>
*Kim Stearman	<i>Extension Specialist - Agronomy</i>
Carlos Robles	<i>Extension Agent I</i>
Dale Morton	<i>Extension Agent I</i>
*Rebecca Day	<i>Extension Agent I</i>
Irene Gibson	<i>Extension Agent I</i>
Alma Wesselhoft	<i>Extension Aide I</i>
Blanche Mills	<i>Extension Aide I</i>
Leona Cline	<i>Extension Aide I</i>
*Amabell Frett	<i>Extension Aide I</i>
*John LaPlace	<i>Extension Aide I</i>
*Lillian Carr	<i>Secretary I</i>
*Deborah Aspen	<i>Secretary I</i>

*Left CVI since 1984

PUBLICATIONS CURRENTLY AVAILABLE

- Virgin Islands Grain and Forage Sorghum Performance Trials.* Technical Bulletin No. 2
- Virgin Islands Tomato, Pepper and Eggplant Variety Trials in 1978-1979.* Technical Bulletin No. 3
- Summary of Vegetable Crop Research, 1980-1981.* Technical Bulletin No. 4
- Grain Sorghum and Forage: Production and Utilization Potential in St. Croix, U.S. Virgin Islands.* Virgin Islands Agricultural Experiment Station Report No. 1
- Senepol Cattle: History and Development.* Virgin Islands Agricultural Experiment Station Report No. 11 (Spanish and English text)
- Native Recipes.* Extension Bulletin No. 1
- Virgin Islands Cooperative Extension Service: A Model for Technology Transfer Systems in the Caribbean.* Extension Bulletin No. 3
- Avocado Production and Marketing.* Extension Bulletin No. 4
- Sorrel Production and Marketing in the Virgin Islands.* Extension Bulletin No. 5
- Island Insects: Handbook for Insect Study.* Extension Handbook No. 1
- Beef Cattle Improvement Handbook.* Extension Handbook No. 2
- Poisonous and Injurious Plants of the U.S. Virgin Islands.* Cooperative Extension Reprint Series No. 1
- Vegetable Planting and Harvesting Guide.* Gardeners Factsheet No. 1
- Seeding Vegetable Crops.* Gardeners Factsheet No. 2
- Growing Vegetable Slips.* Gardeners Factsheet No. 3
- Transplanting Vegetable Crops.* Gardeners Factsheet No. 4
- Mulch For Your Garden.* Gardeners Factsheet No. 5
- How To Prepare Your Own Compost.* Gardeners Factsheet No. 6
- Staking and Training Tomato Plants.* Gardeners Factsheet No. 7
- Growing Spinach in the Virgin Islands.* Gardeners Factsheet No. 10
- Controlling Nematodes in the Vegetable Garden.* Gardeners Factsheet No. 11
- Propagation of Fruit and Ornamental Plants by Layering.* Gardeners Factsheet No. 12
- Propagation of Fruit and Ornamental Plants by Cutting.* Gardeners Factsheet No. 13
- Propagation of Fruit and Ornamental Plants by Grafting.* Gardeners Factsheet No. 14
- Propagation of Fruit and Ornamental Plants by Budding.* Gardeners Factsheet No. 15
- Fertilizing Your Garden for Optimum Yields.* Gardeners Factsheet No. 16
- How Many Teaspoons is 5 Pounds Per Acre? (Weights and Measures)* Gardeners Factsheet No. 17
- Organic Gardening: Soil Fertility.* Gardeners Factsheet No. 18
- Organic Gardening: Pest Control.* Gardeners Factsheet No. 19
- A Simple Home Drip Irrigation System.* Gardeners Factsheet No. 20
- Growing Mangoes.* Gardeners Factsheet No. 21
- Growing Citrus.* Gardeners Factsheet No. 22
- Saving Vegetable Seeds for the Home Garden.* Gardeners Factsheet No. 23
- Growing Mesple (Sapodillas).* Gardeners Factsheet No. 24.
- Testing Soil for Better Yields (Part I).* Gardeners Factsheet No. 25
- Interpreting Your Soil Testing Results (Part II).* Gardeners Factsheet No. 26
- Banana Root Borer and Its Control.* Pest Management Factsheet No. 1
- Pest Control for Home Vegetable Gardeners in the Virgin Islands.* Miscellaneous Publication No. 1
- Essentials of Farm Financial Management: Financial Management.* Farm Management Factsheet No. 1
- Essentials of Farm Financial Management: Depreciation Methods.* Farm Management Factsheet No. 2
- Land-Grant Programs in Action (an overview of Virgin Islands programs).*
- College of the Virgin Islands: Our First 22 Years.*