Virgin Islands
Agricultural Experiment Station
Report No. 3
June 1974

Profitability of
BEEF PRODUCTION
in St. Croix, U.S. Virgin Islands

VIRGIN ISLANDS AGRICULTURAL EXPERIMENT STATION
Fenton B. Sands, Director
St. Croix, U.S. Virgin Islands

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COVER PHOTO: Senepol beef cattle on Pangola grass pasture, St. Croix, U.S. Virgin Islands

FOREWORD

This report, "Profitability of Beef Production in St. Croix, U.S. Virgin Islands," is one of a series of feasibility studies sponsored by the newly created Virgin Islands Agricultural Experiment Station, College of the Virgin Islands. These investigations were financed totally with Federal funds made available to the Station under the provisions of the Hatch Act, Amended.

Preparation of this report was accomplished by contracting for the services of the following team of specialists: Dr. William L. Park, Chairman, Department of Agricultural Economics, Rutgers University, New Brunswick, N.J. and Dr. Robert L. Park, Professor of Animal Science, Brigham Young University, Provo, Utah. This team conducted the study and wrote the manuscript for this report.

The objective of these studies was to try to determine the agricultural enterprises, both plant and animal, that have economic potential on the Virgin Islands. It is my belief that the agricultural industry must be economically sound in order to be viable.

On the Virgin Islands, agriculture has been on the decline since the early part of the 1960's. The average number of farms, farmers, and production of agricultural commodities (with the exception of fluid milk) have all declined at a consistent rate. Among the questions which are uppermost in the minds of many people are: What factors have been responsible for these declines? Can these downward trends be stopped and perhaps reversed? What is the future of the agricultural industry, particularly on St. Croix where 85 percent of the farmland is located? This report on the profitability of beef production, along with the others, sheds some light on these questions.

These feasibility reports have also revealed the areas where lack of training and education on the part of the farmers has adversely affected production. These subjects have now become part of the new program of the V.I. Extension Service. At the same time, the lack of information about the response of crops and livestock in this environment, which also limits production, has been recognized. These gaps in our knowledge have become the basis for the planned research program of the V.I. Agricultural Experiment Station. Thus, these studies have given more direction to the efforts of the Extension and research programs of this land-grant institution. More importantly, the results of these studies are expected to be beneficial to full- and part-time farmers, as well as to potential investors.

This series of reports rests squarely on the belief that a revival of agriculture would contribute substantially to the general welfare through increased output of goods and services and by providing additional employment. Moreover, expanded production and marketing of farm products could provide greater, and in some cases cheaper, sources of nutritious foods for consumers.

A more fully developed agriculture would complement the major industry—tourism—in two ways. First, visitors would be pleased to be served local products, especially tropical fruits and vegetables, by hotels and restaurants where such products are often not now available. Second—and perhaps more important—an expanded agriculture would tend to preserve the environment of exotic tropical islands. Most visitors and some permanent and semi-permanent residents come to the Virgin Islands to seek this environment. If this attraction is destroyed, the basis of the major industry of the Islands will be undermined.

The Virgin Islands Agricultural Experiment Station gratefully acknowledges the cooperative assistance and contributions from many St. Croix farmers; Rudolph Shulterbrandt, Commissioner, V.I. Department of Agriculture and his staff; and Bennett S. White, Jr., project consultant and former USDA agricultural economist, now retired.

Fenton B. Sands, Director
March 1974

SUMMARY AND CONCLUSIONS

By U.S. mainland standards, the St. Croix beef industry is not large. It consists of about 5,000 head of cattle on 7,000 to 8,000 acres of improved pasture land of varying quality on 64 farms.

The climate is well-suited for beef cattle production, but, because of highly variable and frequently insufficient rainfall, the stocking rate of cattle is not high—about 4 acres per animal unit.

This report describes two "benchmark" cow-calf ranches which are used as points of reference to show the beef industry potentials. Ranch I describes present economic conditions and production practices for grass fattening. Ranch II portrays potential production when sorghum silage is produced and fed as a supplemental feed.

Neither benchmark farm was capable of generating sufficient income to cover full production and land costs. The internal rate of return on non-land investment for Ranch I (grass only) was —2%, compared with Ranch II (grass-silage) of 3.9%. Land costs were not included in the calculation because land prices far exceed the value of land for farming purposes.

The break-even price for beef on Ranch I is 62.4 cents per pound compared with 50 cents per pound on Ranch II. The actual price received by beef producers at the time of the present study was 40 cents per pound.

Beef production appears to be used as part of a land-use strategy to reduce the holding cost of land pending its conversion to higher economic uses. The returns are ample to cover out-of-pocket expenses and yield a return to management and a partial return to invested non-land capital.

The present cost-price squeeze is severe enough that most of the beef industry is not likely generating enough income to cover full production costs and a return to management, capital and land. The reason for this state-of-affairs is partly production-oriented and partly market-oriented.

On the production side, carrying capacity of the land can be substantially improved by raising sorghum silage as a supplemental feed for use during the dry season. Brush control as presently practiced appears to be expensive. New methods—possibly herbicides—are needed to reduce such costs. Fencing costs also appear relatively high. New combinations of materials need to be investigated if any large acreage is to fenced in. Supplemental feed sources also need to be investigated.

For the most part, the St. Croix beef industry in the Virgin Islands is producing feeder quality beef for slaughter to serve relatively low-income consumers. Carcass quality is "standard" or "low-good" and does not effectively compete in the high quality market, that is, U.S. mainland beef imported to the Islands. In essence, the Virgin Islands, industry is supplying feeder quality beef to native consumers in competition with feedlot-quality beef from the U.S. mainland.

The usual higher price for feeder animals in relation to fat stock in the U.S. mainland is not available on St. Croix because of the lack of a low-cost feed supply which is necessary for developing a feedlot fattening industry. Feedlot fattening is necessary to raise the grade of animals to U.S. "good" or "choice"—grades that command higher prices. Consequently, a low-cost feed supply for fattening purposes is necessary, else the cost-price squeeze is likely to continue.

Land use strategy is profoundly important to the beef cattle industry. Today, the value of rangeland is always substantially greater than its use for agriculture. Beef production under such conditions is justified, and should be encouraged as a means of reducing the cost of holding land over time pending its development for higher economic uses. Our data indicate that well-run operations can cover out-of-pocket costs which include repairs and maintenance of facilities and management income. The function served by the beef cattle industry in the U.S. Virgin Islands—either in its own right as part of a land-holding strategy, or as a source of protein for low-income families—is a valuable and productive one and measures should be taken to assure its continuance and viability.

The Profitability of Beef Production in St. Croix, U.S. Virgin Islands

by

William L. Park and Robert L. Park

The Virgin Islands were once known as the "Garden of the West Indies." The well-tended farms and agricultural industries have had a long history of excellent productivity. Today the sugar and cotton operations are quiet and farming generally is in a depressed state. The number of farms declined from 466 in 1964 to 212 in 1970—a drop of more than 50 percent. Those farms reporting grazing land dropped even faster than the average—64 percent; land used for grazing declined from 19,611 acres to 7,583 over the same period.

At one time a major part of the 84 square miles of St. Croix was under some form of cultivation—mostly sugarcane. The cane operations of the Virgin Islands Corporation ceased with the 1965–66 crop year. Many people supposed that the sugar land could be easily converted to a local beef or dairy industry. Genuine attempts have been made to bring that goal to a reality, but with mixed success. Today there are several well-run, apparently successful, beef ranches on St. Croix, but large land areas that could support pasture or other feed production are sitting idle.

By U.S. mainland standards, the beef industry in the Virgin Islands is very small. Yet there are those who see a need for a larger local food source inasmuch as nearly 95 percent of the V.I. livestock food supply is imported. In 1964, it was reported that there were 5,975 head of beef cattle and calves on St. Croix, where most of the industry is located.[1] At present, there are approximately 5,000 head of beef cattle on St. Croix, 4,095 of which are on farms with 100 head or more (Table 1).

Coincident with the declining agriculture in the Virgin Islands, demands for food have increased markedly. The population of the Virgin Islands increased from 49,742 in 1965 to 85,000 in 1972, an 81 percent increase.[2] Food demands for tourism have also increased. Tourist expenditures were estimated at $54 million during 1965 compared to $109 million during 1972. Much of the increased expenditure was for food which was not, and is not, available locally.

Table 1.—Size of beef herds on St. Croix, U.S. Virgin Islands, 1973

Herd size	*Number of farms*	*Number of cattle*	*Average herd size*
500 and over	2	2,060	1,030
300 to 499	2	875	438
100 to 299	7	1,160	166
20 to 99	17	635	37
Less than 20[1]	36	280	8
Total	64	5,010	78

[1] Not all of the small farms were surveyed, but this estimate is quite accurate when compared to surveys in 1964 and 1969.

The major objective of this study was to determine the costs, returns and economic feasibility of beef production in the Virgin Islands with primary emphasis on St. Croix. Sub-objectives were (1) to identify and define "benchmark" production units that reflect Virgin Islands conditions, (2) to determine costs and returns to such benchmark units, and (3) to determine the potential profitability of beef production under alternative sets of conditions.

RESOURCE BASE

In 1964, 19,000 acres were reported as pasture in the Virgin Islands. By 1970, the reported figure was

[1] Survey by R. L. Park, O. Skov, and J. Fuertes, Federal Agricultural Experiment Station, USDA, St. Croix, Second Conference on Agriculture, V. I. Dept. of Agriculture.

[2] Virgin Islands Department of Commerce. The growth rate seems to have slowed recently, however.

down to 7,583 acres—a 61 percent drop. The amount of potential pasture is substantial and is available without extensive development cost, provided economic incentives exist for such use.

Today, it is estimated that between 7,000 and 8,000 acres of improved pasture are in use by beef producers. As of July 1973, the four largest ranches had about 6,100 acres of pasture. Beef production areas on St. Croix are located on the southeast central part of the island and in the narrow mountain valleys in the northwest. Potential crop or pasture land of a few thousand acres exists in the southcentral area.

It is evident that there is not enough land available for a large beef industry; therefore, it must operate at a smaller scale than might otherwise prevail.

Factors external to agriculture have exerted a major influence on land use on St. Croix. First, the population of St. Croix increased from 49,700 in 1965 to 85,000 in 1972 and generated a strong demand for land for housing and commercial centers which was not provided by existing population centers. It appears that housing developments for the most part have not been placed on the prime farmland, but the expectations of development have bid the value of farm lands substantially above their farm value. Second, road improvements and auto travel have placed virtually every part of the island within the housing demand zone. Third, industrial demands for land are increasing. And finally, it is becoming increasingly difficult to find competent farm workers at wage rates that make it possible for the enterprise to survive. There is also some evidence that tenure patterns have influenced the development of the lands for agriculture use.

Climate

In general, the climate on St. Croix is favorable to beef production. Temperatures are mild and well within the needed range. Rainfall averages about 43 inches in the beef production areas (fig. 1), but it varies considerably from year to year and from one part of the island to another. Some parts of the eastern end of the island are quite dry and support desert plants, while the mountains in the northwest support a rain forest. There is a quite predictable wet season from August to November, during which period the water-plant demand bal-

*Figures should be 22,000 for 1965 and 41,000 for 1972

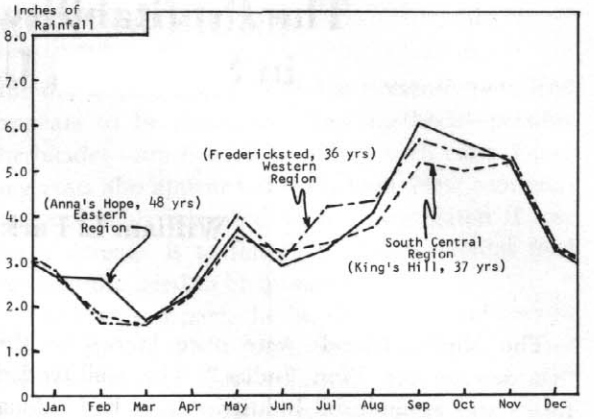

Figure 1. Average Annual Rainfall, Selected Weather Stations St. Croix, U.S. Virgin Islands, Long term Normal Rates. Source: U.S. Weather Bureau, chart by the author.

ance is quite favorable.[3] In the remaining months, moisture is insufficient to maintain continued plant growth. The island is generally free from the full force of the most violent storms that spawn in the Caribbean, but it occasionally receives large amounts of rainfall during short periods of time, which contribute to the instability of the rainfall pattern.

Labor and Other Factors

There is a social stigma associated with agricultural labor, and as a consequence, if a man can find employment elsewhere he usually will do so. Many of the farmworkers on St. Croix are not Cruzans but are "green carders" from other Caribbean islands not under U.S. jurisdiction. The labor market in which agriculture competes is strongly influenced by the higher rates paid by large industrial concerns.

Supplies, equipment and production inputs, though generally available, are much more difficult to procure than in large established agricultural areas. Since St. Croix is a small island, such items must be imported and at times there are aggravating delays. Moreover, costs are high relative to those of the U.S. mainland.

There is a government-operated slaughterhouse on St. Croix with sufficient capacity to handle the

[3]Martyn Bowden, "Water Balance on a Dry Island," Geography Pub. No. 6, Dartmouth, 1968.

production. Because of the smallness of the industry, the market system is quite simple and generally adequate to move the beef from the ranch to the local consumer.

BENCHMARK RANCHES

The authors personally surveyed large and small ranchers to determine present practices and input-output relationships. These ranchers control about 75 percent of the cattle on St. Croix. As a result of this survey, which was supplemented by the judgment of livestock specialists familiar with Virgin Islands conditions, two "benchmark" ranches were identified as points of reference to show the beef industry potentials. Note that neither benchmark ranch describes any one actual unit in all respects.

Benchmark Ranch I represents present practices and input-output relationships. It depends totally upon grass as a source of nutrients for the animals. It is a cow-calf operation under which the calves are weaned at about 7½ months at 550 lbs. and are sold grass-fat for slaughter at 14 months of age and should weigh from 750 to 900 lbs.

Benchmark Ranch II represents potential conditions. Grazing pasture is supplemented by the production of sorghum silage thereby assuring greater utilization of grass during the wet season and making it feasible to efficiently carry feed produced during the wet season into the dry.

In both models, the ranch is defined as having 1,000 acres of productive land. Ranch I has 1,000 acres of pasture; Ranch II has 800 acres of pasture and 200 acres of sorghum. Ranch I has 443 head of stock and Ranch II 754 head; the number of acres per animal unit are 4.0 and 3.1 respectively.[4] Basic specifications for the benchmark ranches are set forth in Table 2; other details are specified in the cost tables which follow.

Table 2.—Specifications for benchmark ranches, beef cow-calf operations, St. Croix, 1973

Item	*Ranch I (grazing)*	*Ranch II (grazing-silage)*
Total acres	1,000	1,000
Pasture	1,000	800
Sorghum	0	200
Acres/animal unit	4.0	3.1
Number of head	443	754
Number of animal units	249	325
Calving percentage	85	90
Brood cow replacement percentage	20	20
Cow-sire ratio	25:1	25:1
Death-loss percentage	2	2
Weaning age	7½ mos	7½ mos
Weight at weaning	550 lbs	550 lbs
Sale age	14 mos	14 mos
Weight at time of sale:		
Cull cows	1,100 lbs	1,100 lbs
Heifers and young bulls	850 lbs	850 lbs
Sale price:		
Cull cows	30¢ lb	30¢ lb
Heifers and young bulls	40¢ lb	40¢ lb
Tax rate	$2/acre	$2/acre
Wage rate	$100/wk	$100/wk
Prerequisites	$100/mo	$100/mo
Interest rate	7½%	7½%

Herd Unit Concept

The concept of a herd unit (HU), as opposed to the traditional animal unit, was developed to facilitate the sensitivity analysis of the break-even points under alternative sets of conditions. The expected herd composition is specified by using calving percentage, cow-bull ratio, replacement percentage, length of time in the herd, and the number of brood cows.

Each component of the herd is given a weight proportionate to the number in the herd in relation to the number of cows with suckling calves. For example, if there are 100 cows with calves in the herd and 90 heifers and young bulls, the cows and calves each receive a weight of 1.0 and the heifers and bulls each receive a weight of 0.9 (Table 3).

The herd unit is expressed in lbs. of TDN [5] required by the animals during a year. A nursing cow needs 4,490 lbs. while a sire needs nearly 6,000 lbs.

[4] Some of the ranchers were feeding 1 lb. of grain per 100 lbs. of body weight to some of the young stock. The prevailing practice seems to be to fatten on grass unless severe drought indicates a supplement is needed.

[5] Total Digestible Nutrients (TDN) as reported in United States–Canadian Tables of Feed Consumption and Nutrients Requirements of Beef Cattle, National Academy of Sciences, 1969–70.

Only a portion of a sire's requirements is assigned to a HU (Table 3).

The carrying capacity of land is determined by dividing the HU value (12,950 for Ranch I)[6] into the available nutrients produced. The resulting number of HU's can then be extrapolated to yield the size of the herd and the number of animals in each component of the herd. The reverse process is also useful. Given the number of HU's, nutrient requirements and acreages can be determined.

Pasture-Carrying Capacity

The principal pasture plant on St. Croix is Guinea grass; lesser ones are hurricane and Pangola grasses. Hurricane grass is a lower yielder than the others and tends to prevail in the drier areas or where other grasses have been over-grazed. According to local ranchers, Pangola grass yields about the same as Guinea grass under stressed conditions but responds to fertilizer when sufficient moisture is available.

The number of acres needed to support a cow and calf varies from place to place on the island in response to the availability of moisture. It typically requires about 4.0 acres to support an animal unit if no supplemental feed is provided. One ranch was able to maintain pasture balance with as few as 2.3 acres per animal unit. Another was able to achieve 3.8 with some supplemental feeding of the young stock. Most of the cattle were being handled at rates of 4.0 to 4.6 acres/AU. If a pasture can be maintained at 4.0 acres/AU, the TDN production per acre is about 1,475 lbs. At this rate, a 1,000-acre ranch could support 113.9 herd units or 443 head under Ranch I conditions (Table 4).

A feed supplement, of course, increases the utilization of grass during the season of ample rainfall. Standing hay is one way of carrying nutrients into the season of insufficient moisture, but at the cost of most of the nutrients. This relationship is illustrated in Figure 2. The surplus nutrients usually available from May to December are large relative to the February-April deficit. Figure 3 illustrates

[6]The TDN requirements for the HU on Ranch I is different from Ranch II because the assumed calving percentage is different. Ranch II has proportionately more calves and young stock than Ranch I thereby giving a lower TDN requirement.

Table 3.—Specifications of a herd unit, beef cow-calf operation, St. Croix, 1973

Herd component	*Number of head*	*Percent of total*	*Annual lbs. of TDN required*	
			Base	*Adjusted for 2% deathloss*
Ranch I:	*Number*	*Percent*	*Pounds*	
Nursing cows	1.0	26.0	4,490	4,445
Calves	1.0	26.0	1,825	1,807
Dry cows or replacements	0.9	23.0	2,464	2,439
Heifers and bulls	0.9	23.0	3,843	3,805
Sires	0.08	2.0	461	456
Total	3.88	100.0	13,083	12,952
(1.0 HU = 12,950 lbs. TDN)				
(1.0 HU = 2.2 animal units)[1]				
Ranch II:				
Nursing cows	1.0	26.5	4,490	4,445
Calves	1.0	26.5	1,825	1,807
Dry cows or replacements	0.8	21.2	2,190	2,168
Heifers and bulls	0.9	23.9	3,843	3,805
Sires	0.07	1.9	403	399
Total	3.77	100.0	12,751	12,624
(1.0 HU = 12,620 lbs. TDN)				
(1.0 HU = 2.1 animal units)[1]				

[1]Cow and calf = 1.0 AU; dry cow or yearling = 0.6 AU; sires = 1.2 AU.

Table 4.—Production capacity, 1000-acre cow-calf beef operation, St. Croix, 1973

Item			*Ranch I (grazing)*	*Ranch II (grazing-silage)*
Acres available to produce forage			1,000	1,000
Acres in pasture			1,000	800
Acres in sorghum for silage			------	200
Lbs. of TDN[1] produced per acre (average)			1,475	1,553
Increased nutrient utilization when supplemental stored feed can be used			------	5.3%
Lbs. of TDN produced per year on pasture			1,475,000	1,242,400
Tons of silage produced/acre			------	23
Tons of silage produced			------	4,600
Percent TDN in sorghum silage				14
Lbs. of TDN produced per year as silage			------	1,288,000
Total lbs of TDN produced			1,475,000	2,530,400
No. of herd units supported by forage			113.9	195.4
Herd composition (herd unit)	*I*	*II*		
Cows, nursing	(1.0)	(1.0)	114	200
Calves	(1.0)	(1.0)	114	200
Dry cows	(0.9)	(0.8)	103	160
Heifers and young bulls	(0.9)	(0.9)	103	180
Sires	(0.08)	(0.07)	9	14
No. of head	(3.88)	(3.77)	443	754
No. animal unit equivalents			249	325
No. animal units per herd unit			2.2	1.6
Acres per animal unit			4.0	3.1

[1] Total Digestible Nutrients.

the role that silage plays in filling the January-May deficit. Less surplus is wasted.

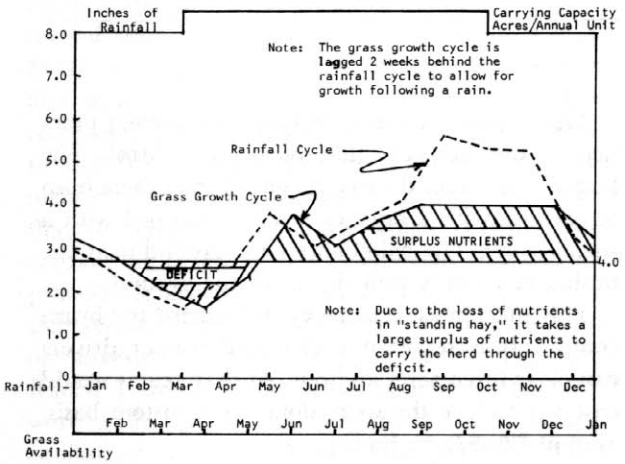

Figure 2. Illustration of stocking strategy which needs a large surplus forage production in the fall to carry herd through a spring deficit, U.S. Virgin Islands.

If the growth cycle approximates the rainfall cycle as illustrated at levels below 4.0 inches of rainfall per month, the total grass consumed per acre increases by about 5.3 percent. The total lbs. of TDN produced on the 1,000 acres increases from 1.5 to 2.5 million (Table 4). The corresponding herd supported by the land increases from 443 to 754.

One rancher with experience in growing sorghum and feeding silage reported that he could consistently yield 23 tons of silage out of the silo per acre. In years of good rainfall, this level of production can be markedly increased. Sorghum silage is about 14 percent TDN which means that sorghum produces about 6,300 lbs. of TDN/acre/year (Table 4).

COSTS AND RETURNS

From a physical point of view, sorghum can increase production capacity from 114 to 195 herd units. Whether the incremental cost is covered by the incremental return is another matter.

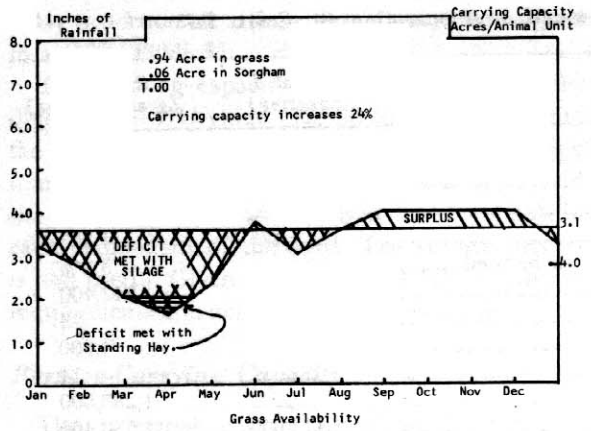

Figure 3. Illustration of stocking strategy which utilizes 90 percent of grass during rainy season and supplements with silage during dry season, St. Croix, U.S. Virgin Islands.

The detailed cost specifications and price estimates are presented in Appendix tables 4 through 7. Labor productivity, wage rates, buildings and facilities cost, production inputs cost, and machinery cost are at levels presently prevailing in St. Croix. A full cost technique was used. Wage and salary estimates include fringe benefits (fica, UI, WC, etc.) plus perquisites such as a house. Buildings and facilities are separately itemized with depreciation and repair estimates.

The major production input for Ranch I is for chemicals for dipping the animals every other week. Pesticides and fertilizer are additional costs under Ranch II. Two major facility cost items are dipping vats and associated corrals and fencing. Fencing under present practices costs $2,300 per mile. A 1,000-acre ranch divided into ten 100-acre fields would require 11.25 miles of fence, or a cost of nearly $26,000.

Present wage rates for beef ranch workers varies from $70 to $120 a week plus a house. Present practices would require about three men to operate 1,000 acres in beef production.

Investment, exclusive of land but including cattle, amounted to $151,273 for Ranch I. This is about $52,000 per worker or $341 per head of cattle (Table 5). Ranch II is built around 800 acres of pasture and 200 acres of sorghum. Sorghum production requires substantial equipment. Ranch II has a machinery investment of $16,650 greater than Ranch I.

Table 5.—Investment and capital cost, 1,000-acre beef cow-calf operation, St. Croix, 1973

Item	*Ranch I (grazing)*	*Ranch II (grazing-silage)*
Non-land investment capital:	*Dollars*	
Buildings and facilities	40,135	41,860
Machinery and equipment	18,550	35,200
Livestock:	(114 HU)	(200 HU)
Nursing cows (1,100 lbs at 30¢)	37,620	66,000
Calves (325 lbs at 40¢)	14,820	26,000
Dry cows (1,100 lbs at 30¢)	33,990	52,800
Replacement heifers ($330 ea)	13,860	23,760
Replacement sires ($450 ea)	1,350	2,250
Heifers and young bulls ($280 ea)	16,240	28,840
Sires (1,500 lbs at 30¢)	4,050	6,300
	121,930	205,950
Total non-land inv. cap.	180,615	283,010
Average investment	151,273	244,480
Interest on inv. cap. at 7.5%	11,345	18,336
Operating capital:		
Wage and salaries expense	23,755	26,040
Fuel, oil, lub. and ins.	3,064	4,022
Contract services	4,165	4,165
Pest control chemicals, misc.	1,460	10,172
Total	32,444	44,409
Interest on 50% of op. cap. at 7.5%	1,217	1,665

The benchmark ranch departs from present practice in one respect—that of brush control. The larger ranches on the island control the acacia bush on pasture with a crawler tractor equipped with a single chisel. The chisel enters the ground near the bush and literally pulls it out of the ground.

This machinery is a heavy investment for brush control. It is reported that skilled tractor drivers can clear three acres an hour. At that rate it would cost less to hire the work done on a custom basis, even at $20-$25 an hour.

Pastures are mowed four times a year. A 40–50 h.p. wheel tractor equipped with a rotary mower is capable of handling the mowing operation. Two such tractors are budgeted for that task. Brush con-

trol costs for labor, equipment fuel and contract dozer services amount to about $15 per acre per year.

Gross Returns

Costs are summarized in Table 5. The 1,000 acre Ranch I grazing operation cannot cover full costs at present beef prices. At the time of this study, prices for liveweight beef f.o.b. the farm were $.40 per lb. for grass-fat yearlings of 850 lbs. and $.30 per lb. for cull cows of 1,100 lbs.

If a rancher (1) maintains a calving rate of 85 percent, (2) sells at the above prices and weights, (3) pays $2 per acre per year land taxes, (4) pays his more skilled employees $100/week plus $100 for a house, (5) has $40,000 invested in fences, wells, ponds, corrals, dipping vats etc., (6) dips his cattle every two weeks for parasite control, (7) mows his pastures four times a year and pulls out acacia every other year, and (8) pays 7.5 percent interest on average invested capital, he can expect to lose about $19,000 per year (Table 6) if he expects no return on the investment in his land.

Ranch II, which specifies that 200 of the 1,000 acres are planted to sorghum, does somewhat better but is still operating at a loss of about $15,360 a year.

As a rule, St. Croix land values are substantially above the value that an agricultural enterprise might support. At the time of this study, land was rarely selling for less than $2,500 per acre. Actually, several tracts of agricultural land were on sale at $3,000 to $14,000 per acre depending upon location and zone. Therefore, residual return to land is computed after a management salary equivalent to $5,000 per year and interest on average investment of 7.5 percent is removed. The model specifies that 40 percent of a manager's time is required to operate the ranch, which is consistent with present practice. A negative residual return to land means that returns are not great enough to cover interest on invested non-land capital or management. Ranch I would about break even if no payment were made for management, interest on non-land capital or land. Ranch II would generate about $9,600 to cover these items.

The residual return to land (RL) can be computed under alternative levels of acres per animal unit, price, taxes and wage rates by using the following equation for Ranch I (grass only) conditions:

Table 6.—Costs and returns, 1000-acre beef cow-calf operation, alternative models, St. Croix, 1973

Item	*Ranch I (grazing)*	*Ranch II (grazing-silage)*
Expenses:	*Dollars*	
Land taxes	2,000	2,000
Wages and salaries [1]	23,755	27,240
Buildings and facilities	3,425	3,206
Production inputs	1,560	10,172
Machinery and equipment	9,266	11,575
Interest on operating capital	1,217	1,665
Total	41,223	55,860
Income:		
Heifers and young bulls	19,635	35,722
Cull cows	14,025	23,111
Total	33,660	58,833
Gross loss or gain	−7,563	2,973
Interest on average non-land investment at 7.5%	−11,345	−18,336
Residual return to land	−18,908	−15,363
	Percent	
Return to land as a percent of average non-land investment [2]	−12.5	−6.3

[1] Includes a salary to management at the rate of $15,000 per year. Forty percent of the manager's time is charged to the beef enterprise.

[2] Land cost is not included as an expense.

$$(1)\quad RL = \frac{336{,}600\ P}{AU} - 1000T - 237.55W - 26{,}813$$

Where RL = Residual return to land after all other costs are covered ($),
AU = Acres per animal unit,
P = Price of liveweight heifers and and bulls f.o.b. the farm ($/lb),
T = Taxes/acre/year ($), and
W = Wage rate ($/week)

The returns in Table 6 are based on the following values for Ranch I:

RL = −$18,908,
AU = 4.0 acres/animal unit,

P=$.40/lb,
T=2.00/acre, and
W=$100/week.

Ranch II has a greater investment in machinery, uses more labor, has a smaller number of acres per animal unit than Ranch I. To compute the residual return to land to this operation under alternative conditions, use the following equation:

$$(2)\quad RL=\frac{455{,}952\ P}{AU}-1000T-272.4W-44{,}954$$

Returns to Ranch II in Table 6 are based on the value of the following cost and income factors:

RL=—$15,363,
AU=3.1 acres/animal unit,
P=$.40/lb,
T=2.00/acre, and
W=$100/week.

To determine returns under alternative prices or acre/animal unit levels, enter the new values into equation (1) or (2) and solve algebraically. For example, if on Ranch I, the wage rate (W) were $80 per week and the selling price (P) were $.60, the residual return to land (RL) would be $2,673. The residual return values for a range of the income and cost factors have been computed and are presented in Tables 7 and 8.

Sales Estimates

Some ranch operations on the island are able to stock the land heavier than presented herein. The following equations (3 and 4) can be used to estimate sales under varying assumptions for ranch size, acres per animal unit, price, and sale weights of animals.

For Ranch I (grass only and 85% calf crop): [7]

$$(3)\quad S_b=\left(\frac{0.17\ A}{AU}\ Wc\ Pc\right)+\left(\frac{0.231\ A}{AU}\ W_{hb}\ P_{hb}\right)$$

where

S_b=Total Sales Value ($)

[7] The brood cow replacement is 20 percent per year.

Table 7.—Ranch I, residual return to land under selected costs-returns situations, 1,000-acres

Acres per animal unit (AU)	*Price/lb young beef* (P)	*Weekly wage rate* (W)	*Taxes per acre* (T)	*Return before interest on non-land capital*	*Residual* [1] *return to land*
	Dollars			*Dollars*	
4.0	.40	80	2	—2,812	—14,157
4.0	.40	80	4	—4,812	—16,157
4.0	.40	120	2	—12,314	—23,659
4.0	.40	120	4	—14,314	—25,659
4.0	.60	80	2	14,018	2,673
4.0	.60	80	4	12,018	673
4.0	.60	120	2	4,516	—6,156
4.0	.60	120	4	2,516	—8,829
3.0	.40	80	2	10,408	—937
3.0	.40	80	4	8,408	—2,937
3.0	.40	120	2	—1,094	—12,439
3.0	.40	120	4	—3,094	—14,439
3.0	.60	80	2	31,148	19,803
3.0	.60	80	4	29,148	15,602
3.0	.60	120	2	21,346	7,800
3.0	.60	120	4	19,346	5,800
3.0	.70	80	2	42,068	28,522
3.0	.70	120	2	32,566	19,020

[1] $RL=\frac{336{,}600\ P}{AU}-1000\ T-237.55\ W-26{,}813$

Land costs are not included in the equation.

Table 8.—Ranch II, residual return to land under selected cost-returns situations. 1,000-acres

Acres per animal unit (AU)	*Price/lb young beef* (P)	*Weekly wage rate* (W)	*Taxes per acre* (T)	*Return before interest on non-land capital* [1]	*Residual return to land* (RL)
	Dollars			*Dollars*	
3.5	.40	80	2	1,699	−16,637
3.5	.40	80	4	−301	−18,637
3.5	.40	120	2	−9,197	−27,533
3.5	.40	120	4	−11,197	−29,533
3.5	.60	80	2	27,753	9,417
3.5	.60	80	4	25,753	7,417
3.5	.60	120	2	16,857	−1,479
3.5	.60	120	4	14,857	521
2.5	.40	80	2	22,542	4,204
2.5	.40	80	4	20,542	2,207
2.5	.40	120	2	11,646	−6,690
2.5	.40	120	4	9,646	−8,690
2.5	.60	80	2	59,018	40,682
2.5	.60	80	4	57,018	38,682
2.5	.60	120	2	48,122	29,786
2.5	.60	120	4	46,122	27,786
3.0	.60	80	2	40,780	22,444
3.0	.60	100	2	35,332	16,996
3.0	.75	80	2	63,578	45,242
3.0	.75	100	2	58,130	39,794

[1] $RL = \frac{455{,}952\ P}{AU} - 1000\ T - 272.4\ W - 44{,}954$

Interest is costed at 7.5%. Land investment is not included.

$\frac{0.17\ A}{AU}$ = Number of cull cows sold

A = Acres of pasture
AU = Acres per animal unit
Wc = Weight of cull cows (lbs)
Pc = Price ($/lb) of cull cows

$\frac{0.231\ A}{AU}$ = Number of yearling heifers and bulls sold

W_{hb} = Weight of heifer or bull (lbs)
P_{hb} = Price ($/lb) of heifer or bull

The sales income for Ranch I in Table 6 is based on the following:

AU = 4.0,
Wc = 1100 lb.,
Pc = $.30/lb.,
W_{hb} = 850 lb., and
P_{hb} = $.40/lb. for a total of $33,660 from the sale of 4.25 head of cull cows and 57.75 head of yearlings. If a ranch can carry more stock than assumed above, the sales can be proportionately greater. For example, if the acres per animal unit are reduced to 3.5 from 4.0, the gross return increases from $33,660 to $38,469.

Estimates for Ranch II can be computed by using Equation No. 4 in the same manner.

$$(4)\quad S_b = \left(\frac{0.2171\ A}{AU}\ Wc\ Pc\right) + \left(\frac{0.3257\ A}{AU}\ W_{hb}\ P_{hb}\right)$$

where the code designations (A, AU, etc) are the same as above. Examples of different sales values at selected stocking rates are presented in Table 9.

Break-even Costs and Returns

The cost of producing grass-fat beef on Ranch I is estimated to be 62.4¢ when all costs except land are included at the levels presented in Table 6. If

Table 9.—Relationship between acres per animal unit and market sales, Ranch II

Acres per animal unit	*Number of head for sale*		*Gross receipts*
	Cull cows	*Heifers and bulls*	
4.0	54	81	$45,595
3.75	58	87	48,635
3.5	62	93	52,635
3.25	67	100	56,117
3.0	72	108	60,794
2.75	79	118	66,370

the carrying capacity can be improved to 2.6 acres per animal unit, other factors remaining the same, a rancher can breakeven at 40¢ per lb. The break-even prices (P), Wage rates (W), and acres per animal unit (AU) can be computed by using the following equations:

Ranch I:

$$(5)\quad P=\frac{(237.55W+28{,}813)\ AU}{336{,}600}$$

$$(6)\quad AU=\frac{336{,}600}{237.55W+28{,}813}$$

$$(7)\quad W=\frac{1416.96\ P}{AU}-121.29 \qquad \text{where}$$

P = Beef price, liveweight ($/lb)
AU = Acres per animal unit
W = Wage rate ($/week)

These relationships are illustrated in Figure 4. To use, find the animal unit value on the vertical axis, move horizontally to the right until you reach an intersection with the desired wage rate, and move directly down to find the price which will allow you to breakeven. To illustrate, a stocking rate of 4.0 and a wage rate of $80/week requires a selling price of 57.5 cents to break even. At $100 a week, the break-even price is 62.4 cents. Detailed data for the curves presented in Figure 4 are set forth in Appendix Table 10.

Similar relationships are presented for Ranch II. The break-even equations are:

$$P=\frac{(272.4W+46{,}954)\ AU}{455{,}952},$$

$$AU=\frac{455{,}952\ P}{272.4W+46{,}954},\ \text{and}$$

$$W=\frac{1{,}673.83\ P}{AU}-172.37$$

These relationships are presented in Figure 5. The break-even price under present price conditions is 50 cents per lb., still some 10 cents above the pay price of 40 cents and the conditions presented in Table 6 and supporting documents.

Although the addition of the sorghum silage enterprise did not prove the ranch capable of covering full costs, it did reduce the cost of production from

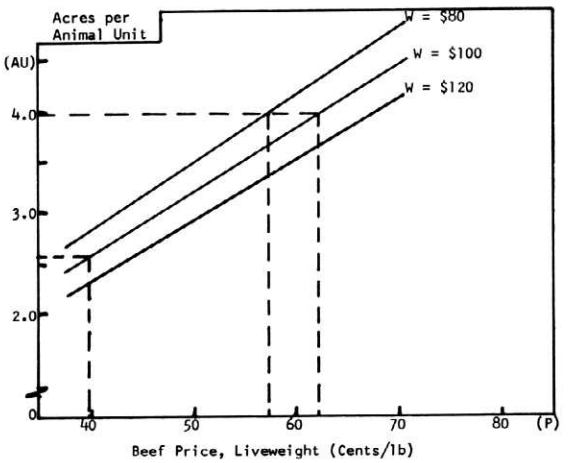

Figure 4. Break-even relationships which yield zero residual returns to land, beef cow-calf operation, Ranch I (grass only), St. Croix, 1973.

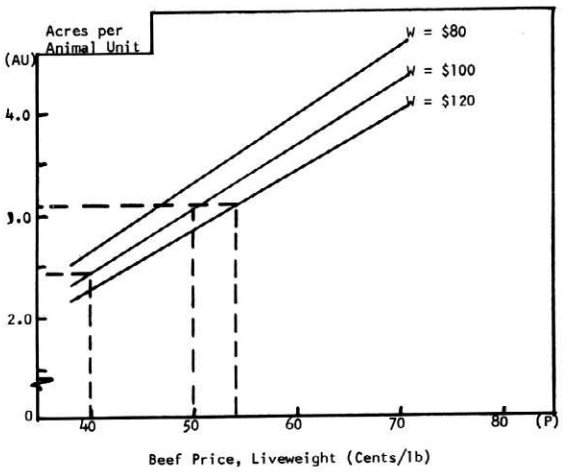

Figure 5. Break-even relationships which yield zero residual returns to land, beef cow-calf operation, Ranch II (grazing-silage) St. Croix, 1973.

62.4 to 50 cents per lb.

Internal Rate of Return

As a further refinement of the foregoing analysis, the internal rate of return, or discounted rate of interest as it is sometimes called, was computed for both benchmark ranches. The internal rate of return provides a measure of long term profitability under specified cash flow assumptions. The concept is particularly useful if year-by-year cost and return relationships are expected to change over time. For example, major capital costs may be incurred during the first 2 or 3 years of a project while the revenues may not reach full development levels until the project is several years underway. Since the internal rate of return is based on discounted cash flows, it is useful in analyzing the above effects even when based upon the same data used in the conventional analysis.

In laymen's language, the internal rate of return is the highest rate of interest on invested capital that an enterprise could afford to pay and cover total costs over the life of the project. Technically, it is the rate of interest at which the sum of the discounted income flow is equal to the sum of the discounted cost flow. Alternatively, it is the rate of interest at which the sum of the discounted difference in the cost and income flows is equal to zero.

The internal rate of return was computed by using the above procedure for both benchmark farms. It was assumed that the cash flow would cover a development period of 15 years. It seemed unwise to select a longer period in view of the uncertainties of agriculture in an urbanizing environment such as that prevailing on St. Croix. As in the earlier analysis, the limited investment concept of non-land investment capital was used primarily because it reflects the dominant land-use strategy on the island, namely, that land is being held for future development and it is devoted to agriculture in the interim as a means of minimizing holding cost. This concept is discussed at some length in the next section of this report.

The internal rates of return on non-land capital for the two benchmark ranches are as follows:

Ranch I, grazing	—2.0 percent
Ranch II, grazing-silage	3.9 percent.

If the rate of interest charged by banks is greater than the internal rate of return, the enterprise is considered not to be feasible since the cost of the capital is greater than its earning capacity. On these grounds, the two models are not considered to be feasible even when no cost is imputed to the land. (See the section on land strategy for a further discussion of the reasons why ranchers might continue to operate under these conditions.)

The data used in computing the internal rate of return is presented in Appendix Tables 8 and 9 and Figure A–1.

LAND USE STRATEGY

From the data presented above, it is clear that prices will have to improve substantially, or carrying capacity of cattle on the land improve markedly, if beef operations are to meet their full costs of production. One may ask what incentives exist for continued production? The answer lies in the land use strategy. If it is intended that the industry be viable in its own right in meeting total costs, it cannot long endure the severe cost-price squeeze it is now under. On the other hand, if the land is being held for future intensive use and a means of reducing the carrying cost of land is needed, beef production may be able to continue for some time into the future as long as out-of-pocket costs can be met.

Under present cost-price relationships, it is unlikely that the degree of production efficiency can be achieved to cover costs of production and generate a return on the investment in land (Table 10). If, however, the land were purchased several years ago at near agricultural prices, and the assets are near full depreciation, existing operations can con-

Table 10.—Capitalized value of land based on its earning capacity at selected rates of interest

Annual residual return to one acre of land	*Capitalization rate of interest*		
	7.5%	*8.5%*	*9.5%*
Dollars	*Dollars*		
10	133	118	105
20	267	235	211
30	400	353	316
40	533	471	421
50	667	588	526
100	1,333	1,176	1,053
500	6,667	5,882	5,263
1,200	16,000	14,118	12,632

tinue. This appears to have been the dominant strategy in recent years.

In 1964, Park, Skov and Fuertes [8] identified 39 beef producers with 20 head of beef or more. This inventory was repeated in conjunction with this study. It was found that 11 of the original 39 producers had terminated operations during the intervening nine-year period, but no new producers joined the industry. It seems that if one is in the business, he can stay; but it is extremely difficult to start.

[8] *op. cit.*

Table 11.—Out-of-pocket costs and returns, 1,000-acre grazing beef operation, St. Croix, 1973

Item	*Ranch I (grazing)*	*Ranch II (grazing-pasture)*
Expenses:	——Dollars——	
Land taxes	2,000	2,000
Wages and salaries	21,355	23,640
Buildings and facilities	896	792
Production inputs	1,560	10,172
Machinery and equipment	7,779	8,332
	33 590	44,936
Income:		
Heifers and young bulls	19,635 (58) [1]	35,700 (105)
Cull cows	14,025 (43)	23,100 (70)
	33,660	58,800
Net loss or gain	$70	$13,864
Return as a percent of non-land capital	0.04%	4.9%

[1] Number in ( ) means number of head sold.

The relationship between out-of-pocket expenses and income is presented in Table 11. Ranch I about breaks even (+$70) while Ranch II nets out $13,864. Under Ranch II conditions, out-of-pocket costs can be met with a stocking rate as high as 4.1 acres per animal unit compared with 3.1 which is believed feasible (Figure 6). The out-of-pocket break-even price is 29.5 cents, 10.5 cents under that received.

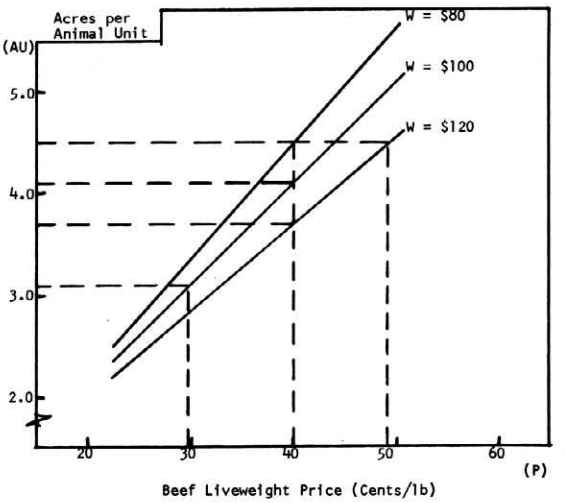

Figure 6. Break-even points to cover out-of-pocket costs, beef cow-calf operation, Ranch II, (grazing-silage), St. Croix, 1973.

APPENDIX

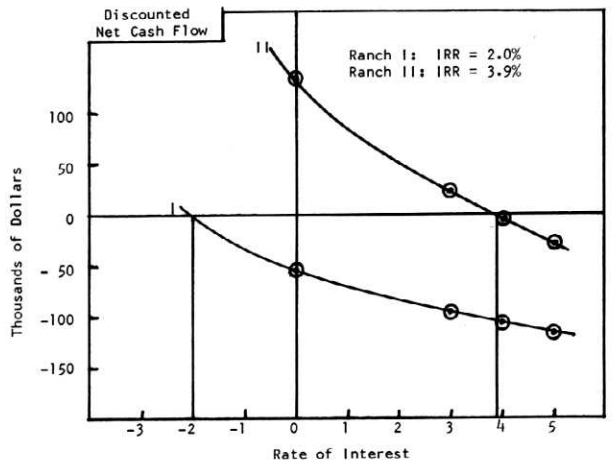

Figure A-1. Internal Rate of return on non-land Investment, beef cow-calf operation, St. Croix.

Table A-1.—Use of land in the Virgin Islands for pasture on grazing, 1964 and 1970

Item	*Census year*		*Percent change from 1964*
	1964	*1970*	
Total number of farms	466	212	−55
Total land in farms (acres)	39,539	20,470	−48
Cropland harvested (acres)	5,134	737	−86
Average size of all farms (acres)	85	97	+14
Number of farms using land for grazing	279	100	−64
On farms of up to 49 acres	181	70	−61
On farms of 50 to 174 acres	57	15	−74
On farms of 175 to 499 acres	24	7	−71
On farms of 500 to 999 acres	9	4	−56
On farms of 1000 acres or more	8	4	−50
Land used for pasture or grazing (acres)	19,611	7,583	−61
On farms of up to 49 acres	1,046	662	−37
On farms of 50 to 174 acres	2,766	850	−69
On farms of 175 to 499 acres	4,332	1,186	−73
On farms of 500 to 999 acres	3,532	1,921	−46
On farms of 1000 acres or more	7,935	2,964	−63
Average amount of land per farm used for pasture or grazing (acres)	70.3	75.8	+7.8
On farms of up to 49 acres	5.8	9.5	+63.8
On farms of 50 to 174 acres	48.5	56.7	+16.9
On farms of 175 to 499 acres	180.5	169.4	−6.2
On farms of 500 to 999 acres	392.4	480.2	+22.4
On farms of 1000 acres or more	991.9	741.0	−25.3

Source: Census of Agriculture, U.S. Department of Commerce, Computations by the author. Land use reported in the 1970 Census was for actual use during 1969.

Table A-2.—Selected characteristics of the livestock industry, St. Croix, St. Thomas and St. John, Virgin Islands, 1970

Item	*St. Croix*	*St. Thomas*	*St. John*	*Total Virgin Islands*
Total number of farms	136	59	17	212
Percentage of farms	64	28	8	100
Land in farms (acres)	17,669	2,249	552	20,470
Percentage of land	86	11	3	100
Harvested crop land (acres)	626	109	2	737
Percentage of land	85	15	—	100
Number of farms using land for grazing or pasture	67	20	13	100
Percent of farms	67	20	13	100
Land used for grazing or pasture (acres)	6,208	1,152	223	7,583
Percent of land	82 [1]	15	3	100
Number of cattle and calves [2]	4,890	706	49	5,645
Percent of head	87	12	1	100
Value of all livestock sold ($)	250,262	35,964	2,347	288,573
Percent of value	87	12	1	100

Source: Census of Agriculture, U.S. Department of Commerce, Computations by the author.

[1] Except for a very few exceptions, beef animals are located on St. Croix.

[2] R. L. Park and O. Skov of USDA, Agricultural Experiment Station, St. Croix, inventoried the beef industry in 1964. They reported head of beef cattle in local herds.

Table A-3.—Average annual rainfall, selected stations St. Croix, U.S. Virgin Islands, long-term normal rates

Month	*Weather station*			*Average of three Stations*
	Anna's Hope	*King's Hill*	*Frederiksted*	
	Inches			
January	2.68	2.68	2.79	2.72
February	2.61	1.83	1.68	2.04
March	1.72	1.60	1.59	1.64
April	2.27	2.34	2.47	2.36
May	3.71	3.65	4.04	3.80
June	2.90	3.22	3.06	3.06
July	3.25	3.36	4.22	3.61
August	4.07	3.78	4.37	4.07
September	6.05	5.19	5.65	5.63
October	5.58	5.03	5.37	5.33
November	5.22	5.29	5.30	5.27
December	3.23	3.27	3.31	3.27
Annual	43.29	41.24	43.85	42.80

Source: U.S. Weather Bureau, computations by the author.

Table A-4.—Wages and salaries cost, beef production unit, St. Croix, 1973

Employee	Man-year of time	Annual Wage or salary			
		Base	Fringe [1]	Perquisite [2]	Total
		Dollars			
1,000-acre grazing operation: [4]					
Manager	0.4	6,000	591	----	6,591
Husbandman	1.0	5,200	512	1,200	6,912
Helper	1.0	4,160	410	1,200	5,770
Temporary workers	0.5	2,080	205	----	2,285
Accountant services [3]	0.2	2,000	197	----	2,197
Total		19,440	1,915	2,400	23,755
Average wages and salaries/acre		19.44	1.92	2.40	23.76
1,000-acre grazing-silage operation: [4]					
1,000-acre grazing operation less:		19,440	1,915	2,400	23,755
Temporary workers [5]		2,080	205	----	2,285
Additional farm worker	1.0	4,160	410	1,200	5,770
Total		21,520	2,120	3,600	27,240
Average wages and salaries/acre		23.60	2.32	3.60	29.55

[1] Includes fica, UI, W Comp., 9.85%.
[2] Either in providing a house or at $100 per month.
[3] Frequently provided by the manager or his wife.
[4] Does not include stumping operation.
[5] To assist in the harvest season, 2 men for 3 months each.

Table A-5.—Buildings and facilities cost, beef production unit, St. Croix, 1973

Unit	Unit cost	Years to replacemtnt	Annual depreciation [1]	Repair cost [2]
	Dollars	Years	Dollars	
1,000-acre, grazing operation:				
Office (10′ × 20′ at $5/sq ft)	1,000	40	25	20
Storage shed and machine shop (20′ × 40′ at $2/sq ft)	1,600	20	80	32
Corrals, loading chute and dipping vat [3]	7,000	30	233	140
Fences (10—100 acre fields and 11.25 miles at $2300/mi)	25,875	15	1,725	518
Wells (2 with pump and trough)	1,660	20	166	66
Ponds (2)	3,000	20	300	120
Total	40,135		2,529	896
Average per acre			2.53	.90
1,000-acre, grazing-silage operation:				
Grazing operation w/o fence	14,260	--	804	378
Trench silo (4600 at $1.50/T)	6,900	30	230	---
Fence (10—100 acre fields, 11.25 mi at 1840/mi)	20,700	15	1,380	414
Total	41,860		2,414	792
Average per acre	41.86	--	2.41	.79

[1] Straight-line method
[2] At 2% of original cost per year
[3] Based on costs by V.I. Department of Agriculture, Bent Lawaetz

Table A-6.—Production inputs and services cost, beef production unit, St. Croix, 1973

	Specification	*Amount*	*Unit price*	*Total*
1000-acre, grazing operation:				
Veterinary services	----------	--------	----	$ 100
Pest control, dipping	Symex, Corral	420 lbs.	$3.00	1,260
Supplies and utilities	Miscellaneous	--------	----	200
Total				$ 1,560
Average input cost/acre				$ 1.56
1000-acre, grazing-silage operation:				
Grazing operation costs	----------	--------	----	$ 1,560
Sorghum seed [1]	Hybrid	2,400 lbs.	.23	552
Fertilizer [1]	15–5–20	800 cwt.	6.50	5,200
Pesticides	Symex	260 lbs.	3.00	780
	Diazonal	400 pts.	2.50	1,000
	Altrazine	600 lbs.	1.80	1,080
Total				$10,172
Average input cost/acre				$ 10.17

[1] For 200 acres of sorghum

Mention of a trade name of a product does not imply endorsement of any kind.

Table A-7.—Machinery and equipment cost, beef production unit, St. Croix, 1973

Item	Purchase cost	Years to replacement	Annual [1] depreciation	Annual [2] repair cost	Hours of operation	Fuel [3] cost	Oil & lub [4] cost	Insurance	Contract services
	Dollars	Years	----Dollars----		Hours	----------Dollars----------			
1,000-acre, grazing operation:									
Pickup truck, ½-ton [5]	2,250	6	375	67	110	330	3	100	----
Wheel tractors, two 40–50 HP	13,000	15	866	390	2,200	2,565	66	---	----
Blade	300	15	20	9	----	----	--	---	----
Rotary mowers, two	2,800	15	186	84	----	----	--	---	----
Miscellaneous tools	200	5	40	---	----	----	--	---	----
Crawler tractor (145 HP) [6]	----	--	----	---	----	----	--	---	4,165
	18,550		1,487	550		2,895	69	100	4.165
(Total mach. and eq. cost = $9,266)									
(Avg. mach. and eq. cost/acre = $9.27)									
1,000-acre, grazing-silage operation:									
Grazing operation cost	18,550		1,487	550	----	2,895	69	100	3,332
Forage harvester	4,500	10	450	135	----	----	--	---	----
Front end loader	1,000	15	67	30	----	----	--	---	----
Planter	900	15	60	27	----	----	--	---	----
Plow	800	15	53	---	----	----	--	---	----
Fertilizer spreader	850	15	57	26	----	----	--	---	----
Disc harrow	1,000	15	67	---	----	----	--	---	----
Wagons, self-unloading (3)	3,000	10	300	90	----	----	--	---	----
Wheel tractor, small	4,000	15	267	120	800	934	24	---	----
Welder and shop tools	600	10	60	---	----	----	--	---	----
	35,200		3,243	978		3,829	93	100	3,332
(Total mach. and eq. cost = $11,575)									
(Avg. mach. and eq. cost/acre = $12.41)									

[1] Straight-line method
[2] At 0.03 of original purchase price per year
[3] Hours of operation were 110, 2,200, and 800 for pickup, large tractors and small tractor respectively
[4] At $0.03 per hour of operation
[5] Half is charged to ranch
[6] Custom contracted at $25/hr. Total range is covered every 2 years at a rate of 3 acres/hour

Table A-8.—Discounted net cash flow for a beef cow-calf operation, Ranch I (grass only), St. Croix, 15-year project period

Year	Non-land capital expenditure	Production cost	Total project cost	Income	Net income flow	Discounted net income flow		
						3%	4%	5%
1 ____	$180,615	$33,590	$214,205	$ 33,660	$—180,545	$—175,291	$—173,594	$—171,951
2 ____		33,590	33,590	33,660	70	66	65	63
3 ____		33,590	33,590	33,660	70	64	62	60
4 ____		33,590	33,590	33,660	70	62	60	58
5 ____	200	33,590	33,790	33,660	—130	—112	—107	—102
6 ____	2,250	33,590	35,840	33,660	—2,310	—1,935	—1,826	—1,724
7 ____		33,590	33,590	33,660	70	57	56	50
8 ____		33,590	33,590	33,660	70	55	51	47
9 ____		33,590	33,590	33,660	70	54	49	45
10 ____	200	33,590	33,790	33,660	—130	—97	—88	—80
11 ____		33,590	33,590	33,660	70	51	45	41
12 ____	2,250	33,590	35,840	33,660	—2,310	—1,620	—1,443	—1,286
13 ____		33,590	33,590	33,660	70	48	42	37
14 ____		33,590	33,590	33,660	70	46	40	35
15 ____		33,590	33,590	163,570	129,980	83,434	72,178	62,520
TOTAL					$ —54,815	$ —95,118	$—104,410	$—112,187

Table A-9.—Discounted net cash flow for a beef cow-calf operation, Ranch II, supplemental silage feed, St. Croix, 15-year project period

Year	Non-land capital expenditure	Production cost	Total project cost	Income	Net income flow	Discounted net income flow		
						3%	4%	5%
1 ____	$283,010	$ 44,936	$327,946	$ 58,800	$—269,146	$—261,314	$—258,784	$—256,335
2 ____		44,936	44,936	58,800	13,864	13,068	12,819	12,575
3 ____		44,936	44,936	58,800	13,864	12,637	12,325	11,976
4 ____		44,936	44,936	58,800	13,864	12,318	11,851	11,406
5 ____	200	44,936	45,136	58,800	13,664	11,787	11,230	10,706
6 ____	2,250	44,936	47,186	58,800	11,614	9,727	9,179	8,666
7 ____		44,936	44,936	58,800	13,864	11,273	10,535	9,853
8 ____		44,936	44,936	58,800	13,864	10,944	10,130	9,383
9 ____		44,936	44,936	58,800	13,864	10,625	9,741	8,937
10 ____	8,300	44,936	53,236	58,800	5,564	4,140	3,759	3,416
11 ____		44,936	44,936	58,800	13,864	10,015	9,006	8,106
12 ____	2,250	44,936	47,186	58,800	11,614	8,147	7,254	6,467
13 ____		44,936	44,936	58,800	13,864	9,441	8,327	7,352
14 ____		44,936	44,936	58,800	13,864	9,165	8,006	7,003
15 ____		44,936	44,936	280,025	235,089	150,904	130,545	113,078
TOTAL	$296,010	$674,040	$970,050	$1,103,225	$ 133,175	$ 22,877	$ —4,077	$ —27,411

Table A-10.—Break-even points which will yield a zero residual return to land, beef cow-calf operation, St. Croix, 1973

Liveweight market price per lb.	*Wage rate per week*	*Acres per animal unit*	
		Ranch I (grazing)	*Ranch II (grazing-silage)*
Dollars			
0.40	80	2.82	2.65
.40	100	2.56	2.45
.40	120	2.35	2.29
.55	80	3.87	3.65
.55	100	3.52	3.37
.55	120	3.23	3.15
.70	80	4.93	4.64
.70	100	4.48	4.30
.70	120	4.11	4.01

Ranch I: $AU = \frac{336{,}600\ P}{237.55\ W + 28{,}813}$

Ranch II: $AU = \frac{455{,}952\ P}{272.4\ W + 46{,}954}$

Table A-11.—Break-even points for out-of-pocket costs, beef cow-calf operation, St. Croix, 1973

Liveweight market price per lb.	*Wage rate per week*	*Acres per animal unit*	
		Ranch I (grazing)	*Ranch II (grazing-silage)*
Dollars			
0.40	80	4.5	4.5
.40	100	4.0	4.1
.40	120	3.6	3.7
.55	80	6.3	6.2
.55	100	5.5	5.6
.55	120	4.9	5.0
.70	80	8.0	7.9
.70	100	7.0	7.1
.70	120	6.2	6.4

Ranch I: $AU = \frac{336{,}600\ P}{213.55\ W + 12{,}235}$

Ranch II: $AU = \frac{445{,}952\ P}{236.4\ W + 21{,}296}$