

PN-ACA-634
PN 2406

OBSERVATIONS OF THE ANTIGUAN AND BARBUDAN LIVESTOCK INDUSTRY

WITH EMPHASIS ON THE PROBLEM OF DERMATOPHYLOSIS

16 to 22 OCTOBER 1982

prepared by

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This analysis was supported by Contract No. LAC-0000-1-00-2030-00 between the Midwest Universities Consortium for International Activities, Inc. and AID, entitled "Technical Support to Mission/Caribbean", Project No. 538-000, under Work Order No. 2. The views expressed herein are the views of the Contractor and are not necessarily the views of AID.

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1. LIST OF ABBREVIATIONS

- C.V.O. = Chief Veterinary Officer
- G.O.A.B. = Government of Antigua and Barbuda
- M.U.C.I.A. = Midwestern Universities Consortium for International Activities
- U.S.A.I.D. = United States Agency for International Development
- E.C.\$ = East Caribbean dollar (approximately US \$2.50)
- U.S.D.A. = United States Department of Agriculture

2. INTRODUCTION

Dermatophilosis, a skin disease of cattle and other domestic animals, manifests itself in a particularly severe form on some islands in the West Indies. Due to their isolation (e.g. being surrounded by water) these islands are not seriously affected by epidemic diseases, which plague the livestock industries in many other tropical and subtropical areas. Consequently, management related diseases, such as dermatophilosis are considered of major importance, and some governments in the Caribbean basin give high priority in their livestock programs to dermatophilosis control.

In order to assess the problem on Antigua, the U.S.A.I.D. mission in the West Indies, upon request of the government of Antigua and Barbuda, asked the M.U.C.I.A. to provide a short term consultant. The consulting visit was made during 16-22 October 1982. During the visit a limited study was made of the dermatophilosis problem and, in addition, of some broader aspects of animal agriculture.

This report provides a summary of the observations and a few recommendations which could lead to some improvements in the control of the dermatophilosis problem in Antigua.

3. DERMATOPHILOSIS: SOME GENERAL INFORMATION

Dermatophilosis or streptothricosis is a bacterial disease caused by Dermatophilus congolense, characterized by crusty dermatitis. The bacteria live and multiply in the superficial layers of the skin of animals, but are also able to form "zoospores" which may survive in dry scabs for periods over one year.

Streptothricosis has a worldwide distribution but is especially common in the humid tropics. In the drier savanna of Africa it has a distinct seasonal incidence; new infections are only acquired in the rainy season.

3.1. Transmission

Although the epidemiology of the disease is not completely clarified, a number of factors seem to enhance transmission.

a. Humidity and moderate to high temperatures. The disease is only seen under humid conditions. In temperate parts of Europe and the U.S. it is only observed in wet humid summers.

b. Influence of skin lesions. Although the evidence is scattered it seems that Dermatophilus is not able to penetrate the intact skin. The most common predisposing lesions are: tickbites, abrasions such as those caused by thorn-bushes, and flybites. Tickbites, especially those caused by Amblyomma spp. with their long mouth parts, are thought to be a major factor in the more severe types of the disease. There is evidence that these ticks also are able to transmit the infection, e.g. ticks have been found to carry the bacteria.

Generally, however, the disease often enters a herd by means of carrier animals, either homologous species (e.g. carrier cow in cattle herd) or heterologous species (e.g. sheep or goat in cattle herd).

3.2. Resistance

Although there has been some limited success in vaccinating cattle against the disease, there is no indication that an exposed animal is resistant to reinfection.

Some animal breeds, especially the purebred N'dama as well as certain individual bloodlines of other cattle, have a high degree of natural resistance to the disease. This genetic trait is fairly rapidly lost after crossbreeding with nonresistant animals.

3.3. Nutrition

The influence of nutrition on the disease has insufficiently been investigated. There seems to be some evidence that animals with zinc-deficiency are more susceptible to the disease.

3.4. Economic importance

The importance of the disease is mainly related to the fact that the condition can rapidly progress to a point of no return. Treatment is often unsuccessful when a large part of the skin is affected; the animals slowly deteriorate, and have to be culled. This culling rate is generally 5% but may be higher. Severe infections also lower the milk production. Scrotal infections, however, do not appear to affect the fertility of bulls.

3.5. Treatment

Streptothricosis is an easily recognizable skin disease and a wide variety of treatments, local as well as parenteral, have been used. Local treatments consisting of application of formalin, engine oil, iodine, phenol and picric acid have been used but are of limited value. Local application of antibiotics mixed with salicylic acid, vaseline, aluminium powder or other carriers are useful to treat early lesions. Insecticidal dips or sprays are of limited curative

value, but enhance the prevention of the disease, probably indirectly through their effect on ticks and biting flies. In some situations regular dipping is the only way to control the disease.

Parenteral treatment with high doses of antibiotics, especially penicillin/streptomycin combinations or long acting tetracyclines, are very useful in low to moderately severe infections, but there is evidence that the bacteria are, over time, able to build up resistance to these drugs.

3.6. General recommendations for control

1. Separation of affected and healthy animals (irrespective of species).
2. Regular dipping (with clean dip) or spraying of affected and unaffected animals to control ticks and flies.^a
3. Prevent the occurrence of other skin lesions or abrasions.
4. Treatment of affected animals and culling of animals which do not improve within 3 weeks. At present the following drugs are recommended:
 - a. single treatment of Pen/Strep combination and b. single treatment with long acting oxytetracyclines.^b
5. Quarantine (6 weeks) and dip or spray any new animals before joining a disease free herd or flock.

^a Some farmers claim that the older arsenical dips were more effective than the presently used organophosphates, but there is little scientific evidence.

^b Treatment should be timed in such a way that direct reinfection is unlikely, e.g. give treatment at the beginning of a dry period/season. Generally animals improve considerably within a week after treatment. There is little use of treating animals in which more than 10% of the skin is affected; these animals should instantly be culled as they are important reservoirs of the infection.

4. DERMATOPHILOSIS IN ANTIGUA AND BARBUDA

Before considering the problem of dermatophilosis (or streptothricosis) in Antigua a few general remarks should be made.

4.1. Introduction

1. The very short survey took place in October just after a fairly dry period and the low prevalence of the disease may not be representative for other times of the year.

2. The Antigua livestock industry is fortunate in that no serious epidemic disease such as rinderpest or foot and mouth disease is occurring on the island. The veterinary authorities should be given some credit as they are continuously involved in control efforts to prolong the "fortunate" situation.

3. Unfortunately the major diseases which do occur on the island, e.g. streptothricosis, mastitis, seasonal undernourishment, red water and photosensitization are all related to mediocre management, and their control is complicated.

4.2. Prevalence

There was a considerable variation in the prevalence of the disease. Of the four government herds examined two were virtually free of the disease whereas the two others showed a prevalence rate between 5 and 10%. The prevalence rate in some other large herds was:

Mr. Hall	less than 1% (out of approximately 150 cattle)
Antigua Distillery	less than 2% (out of approximately 150 cattle)
Mr. Phoenix	less than 6% (out of approximately 32 cattle)

Of the 204 animals examined along the roads when traveling over the island a total of 8% were found infected (Table I).

Table I. Number of tethered or free roaming cattle with streptothricosis

	Adult Cattle	Young Cattle
Examined	170	34
Infected	13	3

Although the number of infected animals may seem low it should be realized that the disease is highly visible and of great concern to owners as well as government authorities.

Sheep and goats were not closely examined but the infection did occur among some of the many animals seen. The condition was not observed on the approximately 25 pigs, 20 horses and 20 donkeys examined. These animals, however, are generally kept under better control and management than cattle.

4.3. Geographic location

There are no records available on the geographical distribution, but it did not seem, during the survey, that the disease was more common in certain parts on the island, as for instance described in St. Lucia, and thought to be related to the distribution of Amblyomma ticks (Butler, 1975). Animals which were roaming, staked or grazing in thornbush area tended to show a higher infection rate. The disease does not appear to occur on Barbuda according to the chief veterinary officer.^c

^c It should be noted here that Barbuda is considerably drier than Antigua and does not appear to be infested with Amblyomma ticks.

4.4. Economic importance

There are no records available on the island concerning the prevalence of the disease, or number of treatments provided. Many claims of animals lost due to the disease should be considered with care as they are at least in part due to the lack of timely culling the infected animals. Still the production losses are considerable. A moderate to severe infection probably causes a 200 lb. weight loss in the animal before slaughter. Assuming a national herd of 15,000 cattle, an infection rate of 10% and a live weight price of E.C. \$1.10/lb. gives an annual loss of E.C. \$165,000.

This figure can be doubled when the prevalence rate increased to 20%. In addition the following other costs/losses should be considered:

1. Cost of treatment. Many owners make an effort to treat, either with local concoctions and with generic drugs.^d Assuming an average cost of E.C. \$10 per animal/year and a 25% treatment rate gives a treatment cost of E.C. \$18,750. This is probably a low estimate as many animals are treated for prolonged periods. Moreover the labor involved in not calculated.

2. Loss of hides and skins. Infected hides are generally of little value to the leather industry. At present hides on Antigua are not used for leather but are mainly sold to fishermen for bait (at E.C. \$20/hide). A newly established tanning company in Montserrat may consider to buy Antiguan hides and the quality of the hides could become more important. The present world market price (approximately U.S. \$.040/lb) is fairly low, however, and expectations should not be set too high.

^d The local name of the disease is mange ("maingee"). Mange as such, caused by mites, is rare on the island. Unfortunately some farmers buy drugs labelled for use against mange as they are not aware of the difference; generally these drugs (mainly insecticides) are not effective.

3. Loss of milk production. Infected animals produce less milk. No estimate can be provided, however, as the overall production is not very high at present.

4. "Image" costs. Streptothricosis is a highly visible disease, recognizable and often noticed by the lay people. This public recognition by Antiguans as well as tourists does affect the image of the livestock industry.

4.5. Present government activities in control of dermatophilosis

1. The Chief Veterinary Officer (C.V.O.) has been successful in placing dermatophilosis on the list of notifiable diseases. Although the effect of this administrative move is limited, it may open up avenues of control of animal movement, early culling, etc.

2. The C.V.O., in cooperation with the extension service of the Ministry of Agriculture, has prepared extension leaflets on the disease.

3. The C.V.O. is making efforts to emphasize extension; at present one of his assistants is overseas to specialize in this area.

4. In addition, the Veterinary Department provides treatment, either local or, when drugs are available, systemic. Unfortunately, the moneys collected for treatment are deposited in a general fund and not funneled back to the department. Consequently, the department often runs out of drugs in the second part of the financial year. This causes bad public relations which, however, are beyond the control of the Veterinary Department.

5. Finally, the government provides dipping services. The few dips available, the lack of proper maintenance of dip strength, and the fact that dipping is often postponed during and after rainy periods have turned many farmers away from government dips, subsequently they use hand sprayers for the application of acaricides.

5. INTERVENTIONS WHICH COULD LIMIT THE EFFECT OF DERMATOPHILOSIS

5.1. Short Term

1. The Veterinary Department should have access to sufficient amounts of medicine to treat early and moderately severe infections. Consideration should be given to provide a "home made" product for local application, and an injectable drug for systemic treatment (see appendix IV). Records should be kept of all treatments.^e Owners should pay for the treatment and the moneys collected should be placed in a revolving account to ensure continuing availability of medicine.

The costs of this immediate intervention is estimated to be U.S. \$9,000 based on a treatment rate of 15% or 2,250 treatments at U.S. \$4 = (E.C. \$10.)

Although initially this assistance is provided to the Veterinary Division, the latter should encourage in the establishment of an infrastructure for private enterprise supplies of medicine.

2. The Veterinary Department should strictly adhere to the rule that only those animals should be treated of which less than 10% of the skin is affected. Treatment of more severely infected animals is often unsuccessful, and is considered a waste. Such animals should be isolated and culled as soon as possible.

Support could be given to the Veterinary Department for clearing existing pastures at Paynters from thornbushes. This would require the use of a backhoe for 100 hours at E.C. \$50/hour.

3. The Department should directly improve the mineral supplementation of animals on the island. Support could be provided for the initial purchase of

^e These records are not only kept to improve the accountability but especially in order to obtain information about the importance of the disease and the usefulness of the services provided.

bone meal and trace mineral salt. In addition, consideration should be given to the support of a short-term study of the adequacy of animal nutrition on the island.

4. Support should be provided to obtain sufficient insecticide for the 4 government dips, but again private enterprise to supply these insecticides should be encouraged as the majority of farmers obtain their own acaricides and do not use government dips. Extension effort should be made to educate farmers in the proper use of their spraying equipment and other control methods. Serious consideration should be given to alternative ways of tick control (see also 5.2.2). The cost of this immediate support will be approximately U.S. \$2000--provided the C.V.O. finds a way to make part of this supply available to individual farmers.

5. The Veterinary Department should improve their recording system and keep records of all treatments and other services in order to obtain better information about the prevalence and importance of animal diseases. These records should be compiled and reviewed in monthly and annual reports. In addition, the department should carry out surveys to determine the disease incidence in all animals, not only those presented for treatment. Although basically the department is sufficiently equipped to carry out this task, considerations should be given to assistance in the form of a short term consultant to set up a recording system and assist in the initial surveys.

Serious efforts should be made to develop an animal identification system.

5.2. Long Term

Further efforts to control streptothricosis require more basic changes in the livestock industry. Among these is a serious effort to control free roaming animals, which besides being a nuisance, do spread the disease. This effort is

not only of benefit to the livestock industry but will also be of great relief to crop farmers.

This effort requires a number of basic changes.

1. In order to eliminate the stray animal problem a considerable amount of land should be cleared and made available for grazing.

1.1. The GOAB should accelerate its efforts to provide lease of freehold land for grazing. Various models could be used; the provision of 20-50 acre plots at a long term lease with a few acres freehold for construction of living quarters is recommended.

1.2. The GOAB, possible with donor assistance, should provide additional communal grazing land for at least 1500 animals. At a rate of 2 acres per animal, 3000 acres should be provided. It should be realized that this is a major expenditure. Clearing, some fencing and other provisions will cost around E.C. \$1000/acre. (see appendix III)

The success of these efforts are only partly dependent on the above listed technical effort. To a great extent they depend on the incentive for farmers to raise livestock. In this respect the present price control of meat should be carefully evaluated and efforts should be made to improve the incentives for livestock raising. Although price controls may politically be an attractive short-term tool, it should be realized that they may have some serious long-term consequences on production.

2. Further investigate the possibility of eradication of ticks. At present the University of Florida, in cooperation with, and funded by USDA, is studying the tick problem in the Caribbean, especially the spread of Amblyomma spp., the intermediate hosts of heartwater disease. Heartwater disease has not been reported on Antigua or Barbuda. Amblyomma spp. were collected from Antigua, Boophilus sp. from both islands. It is hoped that the USDA contract provides

data on the feasibility and cost benefit of tick eradication. The impression exists, however, that the Florida/USDA team is strong on ticks and tick borne disease but weak on farm management, systems and socioeconomic aspects of livestock husbandry including tick control. Tick control seems impossible as long as the animal management is not improved (e.g. at least control of stray animals), this improvement probably requires major changes in husbandry as well as land tenure. It is questionable, however, whether tick eradication on Antigua only will be possible as long as reinfestation from neighboring islands can occur. It is expected that these issues will be addressed before any implementation. In addition, it has to be stated here that eradication of ticks will by no means eradicate streptothricosis.

Alternative means of tick control such as the use of insecticide impregnated tags or bands, a selection of tick repellent grasses and legumes or breeding towards tick resistant cattle may be considered as well.

3. The GOAB should fully participate in the short and long-term efforts and should realize that their present budget for the support of animal health and agriculture in general (less than 8% of the total government's expenditure) may require some additional funds; an investment which will surely produce good dividends when well managed.

6. THE ANTIGUAN LIVESTOCK INDUSTRY

Antigua and Barbuda are two islands, together of approximately 280 km² with a population of 75,000. The major contribution to the countries' economy is provided by the tourist industry; agriculture contributes approximately 10%.

The livestock population in Antigua and Barbuda is estimated to consist of approximately 15,000 cattle, 12,000 sheep, 8,000 goats and a couple of hundred pigs, horses and donkeys. The majority of the livestock is kept by landless farmers, and are tethered all over the island, or in some cases roaming freely and causing considerable crop damage.

6.1. Cattle

Most of the cattle are dual purpose animals (beef/milk), although the majority is kept for beef. Various breeds are kept including Nellthrop, Jamaica red, Friesians and few Zebu type animals. Some farmers try to introduce more Zebu blood to enhance tick resistance which may have some benefit with aspect to dermatophilosis. The government farms (approximately 250 cattle) and the distillery farm (approximately 150 cattle) have mainly Nellthropps which are sold to local farmers for breeding purposes.

Over 80% of the cattle are kept by part-time landless farmers, who generally own between 1 and 10 animals. The cattle are tethered all over the island with a concentration in the central parts, especially around St. Johns. Most of the animals are inspected, watered and moved every day; some owners herd their cattle during part of the afternoon. Most of the cattle owners are elderly male Antiguan; few animals are owned by women. Little is known about the socio-economic aspects of animal ownership; long-term investment ("saving") and obtaining some revenue from milk sales are important reasons for keeping livestock. The milk production is seasonal; the milk is sold directly to neighbors and friends. Some milk is sold to the Antiguan Dairies but this supply is

insufficient for local demand. The dairy, however, is mainly selling reconstituted milk and milk products. The import bill for milk was close to one million U.S. dollars in 1981. A few large farms which own purebred Friesian or Friesian crosses do not milk due to the lack of personnel, and of adequate marketing facilities.

The government provides 4 communal grazing areas, 100 acres each, where farmers with less than 6 animals can graze their cattle for a (too low) fee of EC \$5.50 (U.S. \$2.20) per month^f (which includes free dipping and some supervision). At present there are approximately 320 cattle grazing in these areas. Larger livestock owners are eligible to obtain government land on a long term lease. This is a relatively new project and most of the land provided so far is not yet fully utilized.

Antigua is by no means self-supporting in beef and milk. At present over EC \$8 million of meat and milk is imported. It has to be stated, however, that even 40 years ago the country was a net meat importer (Caribbean Comm. 1949). It seems feasible, however, to reduce the importation by improving the efficiency of the local livestock industry.

6.2. Sheep and Goats

Most sheep and goats are also tethered or free roaming. Local breeds appear to have a fair to good fecundity and breed year around. Very little is known about these species and very little is done about any improvement. Some larger farms have successfully introduced Blackhead Persians and Barbados sheep. Plans are discussed to upgrade the goats with Nubian blood.

^f This fee is highly subsidized as the real costs are calculated to be between EC \$50 and 60.

6.3. Pigs

Although a limited number of pigs are kept, they seem to be fairly popular and pork is in high demand. The possibility of feeding pigs on hotel offal does not appear to be fully utilized.

6.4. Horses and Donkeys

The horses are mainly kept for local racing and for riding by tourists. Donkeys are kept for transport.

7. Some General Factors Affecting Livestock Systems in Antigua

7.1. Climate

Antigua has a tropical climate, modified by the affects of the Caribbean Sea and Atlantic Ocean. The rainfall averages 40 inches/year (lower in Barbuda), but with considerable variations, ranging between 25-73 inches. The rains show a seasonal pattern; half the annual rainfall occurs during August-November. At least 3 inches were recorded during the week of the visit.

Table II. Monthly Rainfall (means 1962-1975)

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
3.76	1.04	1.51	2.41	4.42	2.08	3.08	3.85	4.62	4.80	4.78	3.60

The temperature shows little variation and ranges between 78-82°F (maximum daily) to 72-78°F (minimum daily). Dry conditions are to be considered normal and their effect ("drought") should be considered in any agricultural planning.

7.2. Vegetation and Forage

Nearly all original vegetation on the island disappeared during the time that large parts were under sugar cultivation. Most of the land is range land with Antiguan hay grass and Bahia grass often overgrown by thornbushes (Acacia

sp. and Prosopis sp.). Some pasture lands have been improved with Pangola and Bermuda grass. Efforts are made to introduce legumes.

Forage is available during the rainy season, but is limited during the drier periods of the year. Some forage conservation is implemented on the larger farms. A few farms have sufficient grazing year around. Most other pasture land is overgrazed, although not seriously affected by erosion. It seems that the optimal stocking rate on the island should be between 0.5-0.6 cow/acre. This is rarely achieved, however. The commercial grazing areas are overstocked (stocking rate between 0.7-0.8 cows/acre).

7.3. Land Use

The GOAB owns approximately 60% of all land on the island including most of the potential grazing land. There is some effort to give out land, at present, by means of 10 year leases of 40-50 acres to livestock owners (at a rate of \$40 E.C./acre for developed and fenced in pasture, and \$10 E.C./yr. for undeveloped land). Only the larger farmers participate in this program. The smaller (less than 6 cattle) can use the communal grazing areas. So far, less than 1000 acres have been given out. Freehold or long term leases of some farms have generally improved the pasture as well as the livestock using it.

7.4. Crop Residues/Nutrition

The amount of crop residues available on the island is limited. The sugar cane industry provides a limited amount of molasses which is sometimes available for animal feeding, at \$2.50/gallon. Other byproducts are rarely used. This industry is heavily subsidized, and its future uncertain. Until recently there was also a small amount of cottonseed cake available but a recent outbreak of bollworm disease has considerably reduced the cotton production. Plans to introduce legumes (peanuts, beans) have yet not been successful. The use of

hotel offal for animal feeding was not evident. Consequently, most animals depend on grazing, very few are provided with supplements. Deficiencies are common: animals in the government farms were found to be marginal or deficient in calcium, copper, magnesium, and phosphorus. Their serum levels of selenium, iron and zinc were adequate. (see appendix v)

7.5. Use of Manure

Although cattle grazed almost everywhere, there seems to be little effort to collect manure and use it as fertilizer or for other purposes.

7.6. Part-Time Farming

A major constraint to any development in the livestock sector is the fact that nearly all livestock owners are part-time, most of them are also employed in the government, industry, or in the tourist business. Only a few, mostly elderly, people are full-time farmers. The reasons and incentives for livestock farming are not fully understood but many claim that cattle are owned as a form of savings.^g It has been stated, however, that the savings and attachments to cattle are considerably different from the African "cattle complex".

7.7. Price Controls

The second major constraint on livestock farming is the price control of local meat.^h The price has recently been increased (to E.C. \$2.50-\$3.00/lb) but is still below the prices in other Caribbean countries. These controls tend to reduce the incentive to farm or improve the farm or livestock operation.

^g Government--and most industrial workers do at present contribute to a social security and pension plan.

^h There is no price control on imported or high quality meat sold to hotels or larger stores. Most of the hotels used imported meats.

Quality beef produced by some larger farms and sold to hotels and large stores does not fall under this government regulation.

7.8. Aging of The Farmers/Livestock Owners

A further constraint on development of the livestock sector is the advanced age (55) of the average farmer and livestock owner. Not only is this a concern in future development, but also short-term innovations are very slowly (if at all) accepted by the owners, which are often retired and do not directly keep animals for pure commercial reasons (see also 7.10)

7.9. Animal Nuisance

Many farmers complain about the damage done by free roaming cattle. Livestock owners complain about trespassing cattle, sheep and goats in their pastures and, in case of staked animals, of disturbance of their animals by roaming cattle with the risk of fights, unwanted breeding and transmission of disease.

7.10. Lack of Personal Interest in Farm Work

The larger estates as well as elderly small farmers have difficulty to find farm workers (or sons in the latter case) willing to work. Large scale dairy farming is often given up due to the lack of milkers. Most dairy cows, even in the government farm, are not milked but suckled by their calves. This lack of interest is at least in part due to the low wages paid in agriculture compared to the private sector and government. Some fairly large herds (10 or more) were observed which were owned by young farmers.

7.11. Seasonal Demand

At present the livestock sector is barely able to satisfy the basic local demand. Expanded production, however, may be affected by the seasonality of

demand related to the tourist industry. At present there is no indication that the livestock industry is in any way adapting to seasonal demand, with respect to production, breeding, feeding or fodder conservation.

7.12. The Veterinary Facilities

The country has a chief veterinary officer, a veterinary officer, a livestock officer, four qualified animal health assistants, and the supporting administrative and technical staff. The veterinary headquarters are well housed and nicely located approximately 10 miles out of the capital. Recently the Korean government donated some small trucks and the veterinary office has 3 vehicles. This unexpected luxury is fully utilized, but it may be useful to prepare some long-term plans to maintain this situation, and budget for replacement of vehicles and machinery. The animal health assistants generally use their own vehicles and it seems not unrealistic to make some effort to provide motorcycles for their field duties; it appeared during the visit that some spend a considerable part of the day in the headquarter's offices.

The dipping facilities are fair, but it is questionable whether the strength of the insecticides is well maintained. Two samples collected and tested were below strength. The possibility to provide a testing facility in the Ministry of Agriculture's Chemical laboratory may be given some consideration in the overall planning. The barns, haystorage and agricultural equipment appeared in fair shape, as were fences and watering facilities.

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Appendix I

List of persons consulted:

On Antigua:

Mrs. R. Anthony	Dept. Agriculture (Agronomist), GOAB
Mr. E. Benjamin	Permanent Secretary, Dept. Agriculture, GOAB
Mr. N. Bouton	U.S. Embassy (Charge d'Affairs)
Mr. J. Copeland	U.S. Embassy (Administrative Officer)
Mr. F. Henry	Director of Agriculture, GOAB
Mr. M. Harper	Department of Agriculture (Extension), GOAB
Mr. R. Hall	Livestock farmer and Member of Parlement
Mr. J. Hughes	Assistant Agricultural Development Officer, U.S./AID, Barbados
Mr. D. Lewis	Animal Health Assistant, GOAB
Dr. J. Matthews	Veterinary Officer, GOAB
Mr. C. Mellenson	The Antiguan Distillery Ltd (farm manager)
Mr. C. Phoenix	Livestock farmer
Mr. J. Roberts	Administrative Officer, Veterinary Headquarters, GOAB
Dr. J. L. Robinson	Chief Veterinary Officer, GOAB
Dr. H. Thomas	Ministry of Agriculture (Chemist), GOAB
Mr. Watkins	Meat Inspecting Service, Min. Health

Various other livestock owners and other staff members of the Veterinary Department were consulted.

During the visit I had the honor to be introduced to:

The Honorable Mr. Yearwood, Minister of Agriculture, Lands and Fisheries, GOAB

The Honorable Mr. M. Bish, U.S. Ambassador, Barbados

Appendix I continued

In the U.S. and elsewhere:

Dr. M. Burridge	University of Florida (subcontractor, USDA study on ticks in Caribbean)
Dr. R. Deans	Department of Animal Sciences, Michigan State University (specialist on Central America)
Dr. H. Stowe	Department of Large Animal Clinical Sciences, Michigan State University (nutritionist)
Dr. L. James	Department of Forestry, Michigan State University (forestry expert)
Dr. K. Wilson	Inst. of Intern. Agriculture, Michigan State University (TSM - coordinator)
Dr. G. Uilenberg	Department of Protozoology and Tropical Vet. Medicine, University of Utrecht (expert on ticks and tick borne disease)

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Appendix II

Itinerary

Saturday, 16 October 1982

Travel Lansing-Antigua

9:00 p.m. arrival

Sunday, 17 October 1982

8:30 a.m. Picked up by C.V.O.'s vehicle and brought to Paynter's Govt. farm.

10:00-12:00 Visit with Dr. Robinson and Mr. Lewis.

12:00-2:00 Visit Paynters Government Livestock Farm, pastures, and dip.

Monday, 18 October 1982

6:30 a.m. Early morning visit with local livestock owners in St. Johns.

8:00 a.m. Picked up by Mr. Lewis, visits with livestock owners around St. Johns.

10:00 a.m. Visit with Dr. Robinson and Dr. Matthews at Veterinary headquarters and examination at facilities at Olivers.

12:30 p.m. To airport to pick up Mr. Hughes, Lunch.

3:30 p.m. Visit U.S. Embassy.

6:00 p.m. Dinner with Mr. Hughes.

Tuesday, 19 October 1982

6:30 a.m. Early morning visits with livestock owners near Halcyon Hotel.

8:30 a.m. Visit with Mr. Hughes and Dr. Robinson at Olivers.

11:00 a.m. Visit Southern Antigua and Nelson's Harbour.

12:30 p.m. Lunch with Mr. Hughes.

1:30 p.m. Visit with Mrs. Anthony.

2:30 p.m. Visit CARDI office.

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Appendix II continued

Wednesday, 20 October 1982

- 6:00 a.m. Early morning visit to abattoir.
- 8:30 a.m. Visit Mr. Hall's farm and Greencastle grazing area.
- 11:00 a.m. Visit Glenn's pet shop and medical supplies.
- 11:30 a.m. Visit Antiguan distillery farm.
- 1:30 p.m. Visit Dr. Thomas (Dunbars).
- 3:00 p.m. Visit Mr. Harper (Extension).
- 4:00 p.m. Visit local livestock owners (near airport).
- 6:00 p.m. Dinner with Mr. Hughes.

Thursday, 21 October 1982

- 8:30 a.m. Visit Dr. Robinson at Olivers with Mr. Hughes.
- 10:30 a.m. Visit Minister of Agriculture Permanent Secretary and Director of Agriculture together with Dr. Robinson, Mr. Hughes, and Mr. Bouton.
- 1:30 p.m. Visit with laboratory personnel at Olivers Station.
- 3:00 p.m. Preparation draft report.
- 7:00 p.m. Meeting with Dr. Robinson at hotel.

Friday, 22 October, 1982

- 8:00 a.m. Visit Embassy. Correcting and duplicating report.
- 10:00 a.m. Airport, departure

APPENDIX III

CLEARING AND FENCING

Landclearing with backhoe or bulldozer was calculated to cost E.C. \$50/hour. Uprooting and clearing of thornbushes, directly or after burning, will probably take approximately one day per acre.

The consultant has some concern about landclearing despite the fact that the thornbushes are secondary regrowth on old sugarcane fields. It is suggested to seek some advice on the technical aspects of clearing as well as on the ecological effects, before major commitments are made. Among the possible people to be consulted could be Dr. Lee James at Michigan State University (see appendix I) or Mr. Tom Allan, the UNDP forestry expert in Jamaica (Box 280, Kingston-5).

Landclearing equipment was readily available on the island of Antigua and it seems well possible to hire local contractors for this purpose.

Fencing costs E.C. \$5.50/yard according to C.V.O.'s data. This would be approximately E.C. \$6000 per 10 acres, which appears fairly high for U.S. standards where the cost per acre for triple strand barbed wire fencing is approximately U.S. \$1200/10 acres including gates and labor.

25'

Appendix IV

Treatment

1. Some mixtures of antibiotics and skin tonics have successfully been used for the topical treatment of early lesions. Dr. Bida (personal communication) in Northern Nigeria used a concoction of salicylic acid and an antibiotic mixture used by baby diarrhea, which was brushed in the lesions.
2. Penicillin (70,000 iu/kg) plus streptomycin (70 mg/kg) has been used in West Africa and elsewhere. This drug combination is commonly marketed in many parts of the world under various trade names. The high dose level required makes it fairly expensive (U.S. \$8.00-16.00 per adult animal; the current mail order retail price is \$13.03-13.20 per 250 cc bottle [excluding transport]).
3. Long-acting oxytetracycline also appears to be fairly effective in the treatment of the disease at a dose level of 20 mg/kg. The cost per adult animal is between U.S. \$3.00-4.00. The current retail price is approximately U.S. \$10 per 100 cc bottle. It should be stressed, however, that both Pen/Strep and long-acting oxytetracycline have little or no effect on severe cases of the disease. Early treatment is a prerequisite for success.

Although these drugs can be obtained through Jamaica or Puerto Rico, it seems cheaper to import them directly from the U.S. (through Miami).

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Appendix V

1. Serum levels (ppm) of some essential minerals in cattle from Paynters government farm.

	Range at Paynters (n=7)	Normal level or range in U.S.
Calcium	83 - 93*	90
Copper	0.5 - 0.7*	0.8 - 1.5
Iron	1.6 - 2.5	0.5 - 3.0
Magnesium	17 - 22*	20 - 30
Sodium	2800 - 3200	3150
Phosphorus	79 - 104*	130 - 150
Selenium	0.096 - 0.152	0.07 - 0.30
Zinc	1.0 - 1.4	0.7 - 1.4

* = Low or marginal

2. Suggested nutritional supplementation

Bone meal, given free choice to livestock, may consume 100-400 grams/day/cow

Trace mineral salt, given free choice to livestock; 1 block (10 kg) per 20 cows.

This supplementation may still require some extra magnesium, available as Mg-oxide or Mg-carbonate.

3. A relatively simple way to determine the nutritional mineral status of the livestock herd could involve the collection of blood samples from a representative number of animals from different geographical areas during the dry and wet season. These samples can be analyzed for the above listed minerals for approximately U.S. \$20/unit. This preliminary survey could be followed by a more detailed look at the available fodder and necessary supplementation.