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## The relationship of Haitian small farm management to goat and cattle diseases

VEIT (H.P.), MCCARTHY (F.), FRIEDERICKS (J.), CASHIN (M.), ANGERT (R.). La relation entre la gestion des petites exploitations en Haïti et les maladies caprines et bovines. *Revue Élev. Méd. vét. Pays trop.*, 1993, 46 (1-2) : 39-45

Une étude de 40 semaines a porté sur 43 fermiers, 60 chèvres et 60 bovins, afin d'identifier des conditions anormales ou des maladies, et les facteurs prédisposants saisonniers, liés à la gestion ou nutritionnels. Les exploitations ont été visitées 4 fois, approximativement toutes les 10 semaines, les fermiers questionnés, les animaux examinés et leur sang prélevé pour l'hématocrite, le nombre total de leucocytes et le taux de certaines vitamines et minéraux dans le sérum. Des poils, de la terre et du fourrage ont été prélevés pour analyse. Des déficiences sérieuses en phosphore ont été mises en évidence dans le sol, dans le fourrage et chez les animaux, et des déficiences moindres en vitamine E et A, dues à un manque de fertilisation du sol et/ou des insuffisances alimentaires. Une anémie, présumée d'origine parasitaire, était un signe clinique fréquent chez les chèvres (incidence 43 p. 100) et les bovins (incidence 19 p. 100). Les maladies infectieuses et le parasitisme externe et interne étaient partiellement limités par l'isolement des animaux, leurs mouvements et leur maintien à l'attache, rarement par des médicaments. Généralement, la condition du bétail était passable, les performances reproductives et pondérales mauvaises, mais des maladies graves étaient rares. La nourriture des ruminants provenait entièrement de résidus de cultures vivrières ou de plantes spontanées. Étant donné la pénurie et/ou le coût élevé du fourrage, de l'engrais, des compléments en vitamines et en minéraux, des médicaments et des vaccins, le système actuel de gestion des petites exploitations en Haïti réussit à prévenir des maladies graves, mais n'est pas efficace pour des maladies mineures, la reproduction et la croissance.

*Mots clés* : Bovin - Caprin - Résistance aux maladies - Conduite du troupeau - Alimentation des animaux - Carence minérale - Performance de reproduction - Gain de poids - Croissance - Influence de la saison - Méthode d'élevage - Haïti.

### INTRODUCTION

It has been observed that there was relatively poor growth and reproductive performance of Haitian goats and cattle in the Artibonite Valley of Haiti, West Indies, with minimal gross catastrophic illness (4). The majority of such stock appeared to be in fair or better physical condition, even though there was widespread phosphorus defi-

ciency, lesser vitamin A and E deficiencies, and suspected parasitic anaemia (4). Very little information regarding basic management of such animals was available. Accordingly, a study was done to physically examine a selected group of Haitian goats and cattle, to analyze their serum or hair for selected minerals and vitamins, to analyze related soil and forage minerals and vitamins, and to interview their caregivers. This report focuses on the relationship between the management of these animals, and the reported or observed diseases, conditions and lesions found.

### MATERIALS AND METHODS

#### Selection of farms and livestock

The materials and methods are reported in greater detail elsewhere (4). Briefly, the region of study was in the Artibonite Valley region, within a 12-mile radius of Deschapelles, Haiti. The selected Haitian farmers had received long-standing agricultural support from Hospital Albert Schweitzer (HAS) veterinarians, which enhanced their cooperation and reliability with our investigative team. The specific criteria for participation of farmers in this study included prior participation in a goat deworming program, direct responsibility for animals in this study, local residence, ownership or use of a small farm, and small herd status.

#### Farm visitations

Details of 4 farm visits were described elsewhere (4). Briefly, all participating animals were ear tagged at the initial visit and at all visits, physical examinations were performed on each available animal. Blood was collected by jugular venipuncture for hematology and serum mineral and vitamin assays. Bovine switch or caprine tail hair was collected and stored for mineral assays. A total of 38 soil samples were taken and frozen at -2°C for analysis. Sixty-two forage samples were collected, oven dried, sealed in plastic bags, and stored at room temperature until analysis. On each visit, a questionnaire was administered to the person responsible for daily management of each animal by a Haitian interviewer. Topics covered, respectively, were reproduction, feeding and nutrition,

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health and disease, labour and marketing. The questionnaires were written in both English and Haitian Creole with all dialogue done in Creole. Questionnaires and physical examination data were tabulated and summarized in table or graph forms. Where possible, comparison to known normal values was made.

## Laboratory analyses

### Hematology

Blood was collected for hematocrit, total white blood cell count, and differential white blood cell counts. Hematocrits were determined by standard micropipette procedures, and total white blood cell counts were done with pipette and hemocytometer procedures. Differential white blood cell counts were done after Wright staining of blood smear slides, using standard laboratory procedure (200 cell counts).

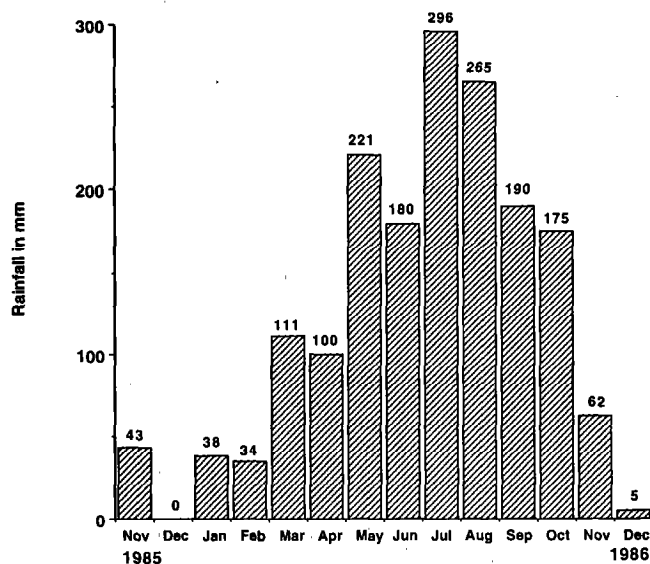
### Vitamin and mineral assays for serum, hair, forages and soil

Samples were collected and stored for analysis at Virginia Polytechnic Institute and State University as previously described (4).

## RESULTS

This region of Haiti (Deschapelles) had a typical rainfall pattern for 1986 as shown on figure 1. Essentially, the winter months (Nov.-Feb.) were relatively dry (mean = 3.5 cm/m), while the spring through fall months (Mar.-Oct.) were relatively wet (mean = 19.2 cm/m).

Feed availability for goats and cattle was reported least plentiful in February and March, and most available for goats around December, and for cattle around July. Body weights of mature female goats and cattle (non-pregnant) over the 4 sampling periods are shown in table 1. Goat weights were obtained by both scale weighing and chest taping, while cattle weights were obtained by tape measure only. Based on questionnaire responses and observations, most goats were loose during the day in the dry season (Nov.-Feb.), and allowed to browse freely. Evenings, most goats were taken into the owner's yard. From March to November, or while there were crops growing for human consumption, goats were restricted in movement by tethering or by yoke collar (to prevent entrance to fenced yards and gardens). Again, these animals were usually kept in yards in the evenings. Food and water was provided to about 1/2 the goats in the evenings, while in the yards. Feed for goats consisted of various crop residues, tree leaves, volunteer grasses, and



Ronald Bluntschl. Mennonite Central Committee, Deschapelles. Personal communication.

Figure 1 : Rainfall in Deschapelles, Haiti (1985-1986).

TABLE 1 Mean animal weights (lbs.) by sampling period.

	1st Period (1/1-2/6)	2nd Period (3/3-4/5)	3rd Period (6/9-6/14)	4th Period (8/18-8/22)*
Point in rainy season	Dry	Early rainy	Rainy	Rainy
Mature female goats <sup>a</sup>	73	68	57	57
Mature female cattle <sup>a</sup>	612	639	641	663

<sup>a</sup> No animals who kidded or calved during the course of the study were included in these figures.

\* Month/date.

a few legumes. No reported or observed plantings for goats or cattle were noted. Most goat handlers moved their tethered goats twice daily, and most said they daily carried feed to their goats. The most commonly reported cut and carried goat feeds were leaves of the West Indian Birch (*Bursera simaruba*), West Indian Elm (*Guazuma ulmifolia*), and Hog plum (*Spondias mombin*) trees, and Sorghum (*Sorghum vulgare*) crop residue. Ninety-two percent of the handlers reported carrying water to the goats at least once daily, but this was not confirmed by our study team.

About 43 % of the cattle were reported to be tethered year round, with the remainder tethered only during the rainy season (Mar.-Oct.). The tethering during the rainy season was done to protect crops, while tethering during

the dry season was done to prevent cattle from being injured, either accidentally or by irate landowners protecting property or crops.

Cattle were usually left tethered in the same area day and night. They rarely were reported to be given extra feed in the evenings, but about 1/3 had feed carried to them in the day time. The most common cut and carried feeds for cattle were residues of corn, plantain, sorghum, sugar cane or leaves of the West Indian Elm (*Guazuma ulmifolia*). All cattle were reported to be walked to a water source at least once daily, and moved about twice daily for better feed access.

Haitian goat or cattle handlers in this study relied entirely on memory. No written records were made even though there was general access to literate individuals. Therefore, precise information regarding signs of sexual activity or reproduction for bucks or does was sketchy, as was previously reported (4). A summary of caprine and bovine reproductive activity is given here (table II). All buck kids (N = 8) in this study were sold before they were 1 year of age. This encouraged outbreeding, although inbreeding was suspected to occur. Older bucks were usually more restricted and were also frequently sold, while female kids were often kept. Normal oestrus behaviors in does were noted, along with vulvar swelling. Very few owners knew the gestation period for does. About 25 % of goat handlers fed extra feed and/or water to presumed pregnant does, and about 1/3 gave extra food and/or water to a nursing doe. No special care was given to newborn kids. First parturitions, when recalled, occurred at about a mean of 14 months. Only 2 handlers recalled a second parturition, at 18 and 12 months later. Based on kiddings observed, kidding interval is estimated to be 11 months, with 1.9 kids/parturition. No dystocias were reported or observed; two abortions and one stillbirth were reported, but none were seen. Handlers claimed to

see the first caprine postparturient oestrus at a mean of 6 weeks, when observed. Based on kidding intervals observed, conception must average about 6 months postparturition. Other than some mastitis, and teat lesions possibly associated with contagious ecthyma, the does had minimal lesions relating to reproduction. Three does had an excessive mucoid vaginal discharge, without oestrus. Nothing abnormal was seen or reported in the bucks or their male reproductive tracts. A summary of caprine diseases or conditions is in table IIIA.

Cattle reproduction was slightly better understood or appreciated by the Haitian handlers, but also was based on no apparent record keeping. About two-thirds of owners of bulls did not know the age of puberty for their bulls. Infertility in bulls was either not recognized or considered. Only 1 farmer expressed an awareness of bull infertility; he presumed it to be due to thinness. There was no knowledge of frequency of breeding or female conception rates. About half of cow handlers remembered first heat, with a mean of 24 months. Almost all cow handlers said their cows were bred by someone else's bull, but they did not know the number of services per conception. About 60 % of the handlers recognized normal oestrus signs. About 1/3 of handlers reported seasonal sexual activity to be highest February to April (table II). This was confirmed by the highest reported and observed calvings being November to February. A majority of handlers of pregnant cattle knew when they were bred and expected to calve. A few (12 %) owners gave extra feed to pregnant cows. No dystocia, abortions or stillbirths were reported or observed. Age at first parturition was reported 1/3 of the time (mean = 29 months), with a mean calving interval of 22 m reported and 26 m observed. The likely actual interval is about 24 m. First postparturient oestrus, when remembered, ranged from 3-104 weeks with a mean of 19 weeks. Based on a 24 month calving interval, conception occurred about 15 months postparturition. Observed reproductive abnormalities in cattle included orchitis and/or epididymitis in 2 mature bulls, testicular hypoplasia in 3 young bulls, and a vesicular vaginitis in 12 of 37 sexually mature females. Also, six females had udder warts, one so severely that nursing or milking would have been difficult or impossible. These and other lesions of cattle are summarized in table IIIB.

**TABLE II** Summary of reproductive activity in Haitian goats and cattle.

	Goats	Cattle
age at puberty – males	3-4 m	15-18 m
– females	10-12 m	20-24 m
breeding seasons	March-April Sept.-Oct.	March-April Dec.-Feb.
gestation interval	11 m	24 m
services per gestation	ND <sup>a</sup>	ND
progeny per gestation	1.9	1.0
abortion rate <sup>b</sup>	7.2%	0.0% <sup>c</sup>
stillbirth rate <sup>b</sup>	3.6%	0.0% <sup>c</sup>
dystocia rate <sup>b</sup>	0.0% <sup>c</sup>	0.0% <sup>c</sup>

a : ND = Not determined due to insufficient data.

b : rate = event per pregnancy x 100.

c : Covered in the questionnaire but not reported by farmers or observed by investigators in study animals.

HANDLERS reported 74 % of the goats and 82 % of the cattle to never have been sick. The HAS veterinarian confirmed that few goats or cattle were noted to suffer severe or fatal clinical illness in this region, and these observations also failed to reveal any major severely debilitating or fatal disease. On the other hand, there was considerable evidence of nutritional diseases, specifically deficiencies in P, vitamin A and E, reported elsewhere (4). Further, there was a high incidence of anaemia, associated with other hematologic abnormalities and with the middle to late rainy season, all suggestive of internal parasitism. There was also a variety of foetal and neonatal goat losses, previously reported (4).

**TABLE III** Estimates of reported and observed diseases or conditions in goats and cattle from selected farms in the Artibonite Valley (Deschapelles region), Haiti, West Indies.

A - Goats			B - Cattle		
I. Goat diseases or conditions reported via questionnaires			I. Cattle diseases or conditions reported via questionnaires		
Condition name	Incidence (%)	Overall mortality rate (%)	Condition name	Incidence (%)	Overall mortality rate (%)
1. Internal parasitism, presumptive	16.0	0.4	1. Internal parasitism, presumptive	18.0	0.0
2. Pediculosis (lice)	12.0	2.0	2. Ticks	2.8	0.0
3. Abortion	7.2 <sup>a</sup>	7.2 <sup>a</sup>	3. Anthrax, possible	2.0	2.0
4. Neonatal death, cause unknown	7.2 <sup>a</sup>	7.2 <sup>a</sup>	II. Cattle diseases, conditions or lesions observed via study		
5. Stillbirth	3.6 <sup>a</sup>	3.6 <sup>a</sup>	1. Low serum phosphorus	85.0	0.0 <sup>c</sup>
6. Neonatal death with diarrhea	3.6 <sup>a</sup>	3.6 <sup>a</sup>	2. Tick infestation, few to light	55.0	0.0
7. Neonatal death with maternal mastitis	3.6 <sup>a</sup>	3.6 <sup>a</sup>	3. Vesicular vaginitis	32.0 <sup>a</sup>	0.0
II. Goat diseases, conditions or lesions observed during study			4. Low serum vitamin A	31.0	0.0
1. Low serum phosphorus	80.0	0.0 <sup>b</sup>	5. Low serum vitamin E	27.0	0.0
2. Low serum vitamin E	76.0	0.0	6. Parasitic anaemia, presumptive	19.0	0.0
3. Parasitic anaemia, presumptive	42.0	0.0	7. Testicular hypoplasia	17.6 <sup>a</sup>	0.0
4. Superficial exfoliative dermatitis	26.6	0.0	8. Orchitis/epididymitis	11.8 <sup>a</sup>	0.0
5. Low serum vitamin A	23.0	0.0	9. Papillomas	11.6	0.0
6. Teat lesions	7.0	0.0	10. Focal dermatitis, presumptive	10.0	0.0
7. Fibroma(s)	5.0	0.0	11. Teat lesions, including warts	8.1 <sup>a</sup>	0.0
8. Vaginal discharge, mucoid, chronic	5.0	0.0	12. Parasitic diarrhoea	6.7	0.0
9. Contagious ecthyma, presumptive	3.3	0.0	13. Mastitis	5.4 <sup>a</sup>	0.0
10. Ringworm, presumptive	3.3	0.0	14. Oral ulcers, mild	5.0	0.0
11. Pediculosis (lice)	3.3	0.0	15. Vulvar dermatitis	3.3 <sup>a</sup>	0.0
12. Mastitis	1.7	0.0	16. Babesiosis	1.0 <sup>b</sup>	0.0
13. Solar dermatitis	1.7	0.0			

a : This is the incidence based on 28 pregnancies.

b : No mortalities were reported for any of the study animals within the duration of this study.

a : This incidence is of the eligible members of the appropriate gender, not all the animal species of the study.

b : This animal was outside the study, but with a group of HAS cattle in the study. Diagnosis was made by the attending HAS veterinarian.

c : No mortalities were reported for any of the study animals during this study.

All diseases or abnormal conditions are listed in table III, which includes both reported and observed disease. The reported diseases are calculated on the basis of the memory, given earnestly and willingly, but not presumed to be highly accurate. The observed conditions or diseases are reasonably accurate within this select group of Haitian goats and cattle. Comparing the reported diseases with those observed, it is clear that the Haitian farmers appreciated the caprine and bovine conditions involving external parasites and deaths, and internal parasitism to a lesser degree. They tended to either ignore or miss the less biologically severe conditions and could not appreciate the vitamin and mineral deficiencies revealed by analysis. In short, they underestimated the disease problems of their stock.

Labour management of the Haitian stock showed that the animal handlers are usually the owners (50 % of goats,

59 % of cattle) or some other family member, often one of the children. Men and women, in equal incidence, cared for goats. Adult males more frequently cared for cattle. Among children, boys more commonly cared for the stock. Regardless of age, gender, or ruminant species, the same person usually tethered, moved, and carried food or water for a given animal. When recognizable illness occurred, the local Haitian veterinary technicians or the HAS veterinarian were used by all the cattle handlers, and three-fourths of the goat handlers. The remaining goats were cared for by the owner or a relative. About half of these animals were not treated, while the others were given some kind of home treatment or extra care.

Milking of cows was fairly universal, although recollections of the amounts of milk collected were vague, and the milking schedule was rather loosely arranged. Lactating goats were rarely milked, although children

often against parental approval were known to sneak milk from goats. Use of cattle for traction was not practiced in this region, although cattle are used for plowing 18 miles away in Lachapelle, and elsewhere in southern Haiti.

Questionnaire information regarding marketing only extended to the point of sale of such animals, not beyond. Nearly all of the 43 farmers in this study raised their goats and cattle for sale, not for home consumption. Most owners (58 %) thought their animals were sold for short-term breeding and eventual slaughter, 39 % said for long-term breeding (with eventual slaughter presumed), and only 3 % said animals were sold strictly for slaughter. About one-third of the owners expected to eat meat from their animals. In most cases of local sales, they likely bought back some of the meat from local butchers.

Preferences in purchasing goats and cattle gravitated towards large size as a primary desirable attribute. Some cattle owners were attracted to excellent lactators. Distinct small size in either species was discriminated against. Does and bucks were sold for a mean of \$20 each, female kids for \$ 11, male kids for \$ 9, with a considerable price range for each category.

Mean prices for cows were \$ 251, bulls \$ 262, heifer calves \$124 and bull calves \$ 98. In this study, males were sold readily, hence, there was an 80 % sales attrition rate (12/15) of caprine males from start to finish and 41 % sales attrition rate for bovine males (7/17). Examination of mean body weights versus mean sale price shows goats selling for \$ 0.32 per lb. live weight, and cattle selling for about \$ 0.38 per lb live weight.

## DISCUSSION

The Haitian farmers' perception of disease problems was less than the real incidence. Part of this perception occurred because of a true difference in opinion or concept, as to what is disease. Part of the difference is due to an inability to appreciate or understand the disease. Finally, part of the underestimation of disease was due to a lack of record-keeping and objective analysis by the farmers. There appeared to be a total absence of written records for livestock management. Part of this is simply an inability of some farmers to read or write; however, many farmers do have access to literate family members, neighbours or friends to assist in reading or writing when desired. There simply is no tradition to keep records. Further, no one has demonstrated sufficient benefit of such written records in the evaluation of reproductive or growth efficiency on small farms and improved management and/or increased profits. The lack of written records also retards or prevents data acquisition relative to nutrition, either from the perspective of feedstuff efficiency or individual animal performance to a given ration. The Haitian management style for feeding goats and cattle is

simple: all feed is essentially scavenged from crop residues, annuals, or perennial plants indigenous to the area. There were no reported or observed plantings specifically for goat or cattle use. Therefore, there is little to no direct stimulus for concern about feed efficiency since there is no out-of-pocket feed expense for goats and cattle and no apparent desire to spend money to purchase feedstuffs. Further, due to the general surplus of available labour, animal feeding and care is assigned little to no value. Presumably, if there were significant labor costs, labour efficiency might take on relevance or value for consideration, but it was not important to the subjects of this study. In summary, reproductive, growth, feed, and labour efficiency and the record keeping necessary to measure them had little or vague perceived value to the studied Haitian farmers. Demonstration projects that show important material benefits for the Haitian farmer by use of written records might motivate some of them to acquire and use record keeping skills.

As previously mentioned, goat and cattle feeding is primarily a scavenging process involving free grazing or browsing within limited areas during the dry season, and tethering or yoke use for the wet season ; some stock, especially cattle, are tethered year-round. What is particularly important is that tethered, yoked, or free, roaming stock are rarely kept together, even on farms with larger (up to 30 head) herds. Rather, they are usually isolated as individuals or in small groups. This isolation of stock is the single best feature of Haitian small farm livestock management because it has tended to inhibit spread of external and internal parasites, and infectious diseases. Those who have tampered with the above isolation by placement and aggregation of goats and cattle into larger groups for pasturing, supplemental feeding, reproductive or other management purposes, usually have had significantly increased incidence and/or severity of infectious and parasitic diseases. The above isolationism needs to be maintained in any future attempts at "improving" Haitian small farm management. Interestingly, the one place where animal isolation is commonly broken, is in the evening when most goats and a few cattle are brought together in the yard, near the house. During this time, stock are often close enough to each other to transmit infectious agents and parasites directly, or via faecal ingestion. This evening aggregation should be further examined for ways to minimize infectious and parasitic disease transmission. One way to reduce parasite egg ingestion in yards would be to create off-the-ground feeders and to promote rapid and total cleaning of the yards of faecal material. This manner of internal parasite transmission is likely a primary mode of vertical and horizontal transmission for goats. The mean caprine body weights declined from the early to late rainy season and there were concurrent anaemia and white blood cell abnormalities (4) ; these findings are suggestive of internal parasitism. Using more specific rotational or placement procedures for day time feeding of goats and cattle could also reduce parasitic egg or larvae ingestion from fecal contamination. Improvements of daytime feeding would enhance

ce what is already partially effective management for infectious or parasitic disease control. Based on questionnaire responses regarding etiology of both external and internal parasitic diseases, Haitian farmers have only a vague understanding of how these parasites spread. They likely have learned their present management procedures by empirical experience and evolved traditions. In any case, the present livestock feeding management works fairly well but could be much better. The use of antiparasitic veterinary drugs has excellent efficacy but their costs, and difficulty in delivery, storage and administration, will likely continue to retard wide scale use for small farms in Haiti. Education and use of optimal management for infectious, and particularly parasitic, disease control could be very cost effective, given that free or low cost labour is currently so freely available.

This study also noted a couple of indigenous herbal antiparasitic treatments (4). Objective evaluation for efficacy of such reported treatments would seem to be worthwhile.

Due to the fact that goats and cattle did not feed exclusively on crop residues, the severe soil and plant phosphorus (P) deficiency was not as critical as it could be. Crop residues from long-term irrigated soils tended to be the most deficient in P, presumably because of long-term cropping depletion without P replacement. There was a tendency (not statistically validated) for the perennials and annuals growing at field boundaries and on non-irrigated soils to have higher, but still deficient P levels. Therefore, the dietary blending of scavenged materials produced at least one positive nutritional benefit by slightly increasing mean dietary P. Such random mixed feeding might have an impact on other nutrients such as Vitamins A, E, and Zn intake, but our data were not sufficient to allow for interpretation of this. The ratio of Ca to P in soils and plants of the study region was so severe so as to require dietary supplementation of animal feeds with a P-containing supplement containing little or no Ca, in order to correct not only the absolute P deficiency, but the incredibly high Ca/P ratio. Both the absolute P deficiency and the high Ca/P ratios (above 7/1) can greatly impair reproduction and growth (1,2,3). Buying and feeding such a mineral supplement, or a more comprehensive vitamin-mineral-concentrate supplement would be a relatively unique management practice for the Haitian farmers in this study. Likely, they would need to be thoroughly convinced that such an effort was worthwhile. Given that the Haitian farmers lack ability or experience in evaluating livestock reproduction, production or feeding efficiency, evaluation of the cost-benefit ratio of a feed supplement would be a new mental exercise for the Haitian farmers of this study. A final drawback is that in the past, a variety of agricultural programs have been introduced to Haitian farmers which required non-indigenous supplies or equipment, only to be eventually cut-off, curtailed, or manipulated by increased pricing and/or taxation. Haitian farmers have seen this occur often enough to realize these circumstances create a fragile dependency for the users of such supplies or equipment. Therefore, there is a strong

tendency for Haitian small farmers to be "minimalists," that is, to avoid use of anything, including feed supplements, which would make them dependent on anyone else. This is a survivalist attitude, not easily overcome by strictly mathematical arguments of greater profitability. Such minimalist attitudes are part of the Haitian small farmers attitude towards life in general, not only livestock production. Therefore, part of the strategy to change goat and cattle management goes beyond the technology; it requires emotional reassurances, as well. An ideal solution would be to find one or more local sources of phosphorus which Haitian farmers could easily acquire and use, at low cost, in order to bypass importation, distribution, taxation and other hidden costs or control procedures. Unfortunately, such has yet to be identified in Haiti.

## CONCLUSIONS

The Haitian farmers of this study tended to underestimate, or not appreciate some of their goat and cattle disease problems, particularly those with a nutritional etiology, or those having subtle lesions or effects.

The Haitian farmers of this study keep little objective data regarding their livestock reproductive or production activities. No written records were noted to be kept or used. This lack of objectivity prevents understanding and appreciation of improved efficiency of many aspects of livestock production, as well as true incidence and effect of disease problems. Any future enhancement of livestock production efficiencies will need to include basic record keeping and use of such for increased profitability.

The Haitian farmers of this study have a slight bias towards favoring cattle over goats. This is seen in the tendency for more young and adult males to be put in charge of the cattle, while goats are more often left to the care of women or younger girls. Also, cattle were usually given better attention, in regards to feeding and watering. Finally, they sold at a mean 16 % higher price per pound of body weight (\$ 0.38/lb. vs \$ 0.32/lb. live weight for goats). There is also a distinctive size bias, in the sense that Haitian farmers will pay a premium for perceived largeness, within species, beyond body weight differences.

Haitian farmers in this study did not use cattle for traction, even though knowledge of such is well-known, nor did they use goat milk routinely for human consumption. The reasons for this are unclear, but deserve further evaluation, given there are some positive reasons to do so.

The Haitian farmers of this study rely almost totally on a scavenger system for feeding their ruminants. This system has 2 major advantages :

- low cost : there are minimal expenses associated with this system, and low dependency on others for feed, supplies or equipment ;

- fair to excellent infectious and parasitic disease control, with excellent individual animal observation and care, within the environmental limits of each farm.

The main disadvantages of this system are :

- high labour needs : labour is given little to no value, due to the current lack of paid employment opportunities ;
- nutrition is highly variable, and subject to large problems with quality and quantity of feedstuffs ;
- limited water availability ;
- oestrus detection and breeding activities are potentially more difficult to control and manage.

The Haitians manage their goats and cattle reasonably well, given their knowledge and resource limitations. Some low cost, large improvements in production efficiency could occur with appropriate management improvements in record-keeping and use, and in disease and parasitic control measures.

The deficiency of phosphorus in the soil, plants and animals of this study appears to be causing the largest single production limitation. A feasible phosphorus supplement for the livestock and/or soils is badly needed, and should be incorporated into the nutritional management of the farms in this study as soon as possible.

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A 40 week study of 43 farmers, 60 goats and 60 cattle was conducted in order to identify abnormal conditions or diseases and predisposing seasonal, managerial or nutritional factors. Farms were visited, farmers interviewed and animals examined up to 4 times, about every 10 weeks and bled for Ht, total WBC, selected serum vitamins and minerals hair collected for mineral analysis. Soil and forages were collected for analysis. There were serious soil, forage and animal phosphorus and lesser vitamin E and A deficiencies due to a lack of appropriate soil fertilization, and/or dietary insufficiency. Presumptive parasitic anaemia was a common clinical sign in goats (43 % incidence) and in cattle (19 % incidence). Infectious diseases, external and internal parasitism were partially controlled by animal isolation, movement and tethering, rarely by therapeutics. Overall, livestock condition was fair, reproductive and growth performance poor, but catastrophic disease rare. Ruminant feeding was entirely from scavenging of crop residues for human consumption, or voluntary plants. Given the scarcity and/or high cost of forages, fertilizer, vitamin-mineral supplements, drugs and vaccines, the present system of Haitian small farm management is successful in catastrophic disease prevention, but is inefficient for minor diseases, reproduction and growth.

**Key words :** Cattle - Goat - Disease resistance - Livestock management - Animal feeding - Mineral deficiency - Reproductive performance - Live weight gain - Growth rate - Seasonal effect - Farming system - Haiti.

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**VEIT (H.P.), McCARTHY (F.), FRIEDERICKS (J.), CASHIN (M.), ANGERT (R.).** Relación entre los sistemas de manejo en pequeños establecimientos haitianos y las enfermedades en ganado caprino y bovino. *Revue Elev. Méd. vét. Pays trop.*, 1993, **46** (1-2) : 39-45

Se llevó a cabo un estudio en 43 establecimientos , en 60 caprinos y 60 bovinos, con el fin de identificar los estados anormales o enfermedades, así como las predisposiciones estacionarias, de manejo y/o nutricionales. Los establecimientos fueron visitados, los finqueros interrogados y los animales examinados hasta 4 veces, a intervalos de 10 semanas. Se tomaron muestras de sangre para hematocrito, recuento de leucocitos, selección de vitaminas y minerales séricos. El análisis de minerales se hizo gracias a la colecta de pelo de los animales. Se recolectaron también suelo y forrajes, para los análisis respectivos. Se observaron serias deficiencias de P y en menor grado de vitaminas E y A, tanto en suelos, como en pastos y animales, ya sea debido a la falta de fertilización apropiada de los suelos y/o a insuficiencias nutricionales. Se observaron frecuentemente síntomas clínicos de anemia parasítica en cabras (con una incidencia de 43 p. 100) y bovinos (con una incidencia de 19 p. 100). Las enfermedades infecciosas externas y el parasitismo interno fueron parcialmente controlados mediante el aislamiento, fijación y la redistribución de los animales, pero raramente mediante tratamientos terapéuticos. La condición general del hato fue pobre, con bajas tasas de crecimiento y reproducción, sin embargo, las enfermedades graves fueron raras. La alimentación de los rumiantes se compone principalmente de restos de cosechas para consumo humano o de plantaciones voluntarias. Dada la escasez y/o el alto costo de los forrajes, los fertilizantes, los suplementos minerales y vitamínicos, los medicamentos y las vacunas, el sistema actual de manejo en las pequeñas explotaciones haitianas es exitoso en lo concerniente a la prevención de catástrofes sanitarias, pero insuficiente en lo referente a enfermedades menores, reproducción y crecimiento.

**Palabras claves :** Bovino - Caprino - Resistencia a las enfermedades - Manejo del ganado - Alimentación animal - Carencia mineral - Reproductividad - Aumento de peso - Crecimiento - Efecto estacional - Sistema ganadero - Haití.