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THE PRODUCTIVITY OF INDIGENOUS
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The Productivity Of Indigenous and Exotic Strains Of Sheep On North Andros Island, Bahamas

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INTRODUCTION:

Bahamian sheep production enterprises show a high potential of being acceptable in a mixed farming system. Sheep are hardy and adaptable and easily handled by inexperienced stockmen. Minimal capital inputs are required for the establishment of successful sheep enterprises and returns are realized in a relatively short time, resulting in a favorable cash flow situation. Furthermore, sheep are excellent foragers that can produce a high-quality product on pastures without grain supplementation.

Sheep production in the Bahamas has, in general, developed without much regard to intensive management techniques. Few, if any, flocks have been evaluated on improved pastures under adequate nutritional regimes. Pastures are generally areas of fenced bush containing edible indigenous and introduced species such as pigeon plum (*Cocolobis floridana*), lignum vitae (*Guaiacum officinale*), jumbey (*Leucaena glauca*) and gumelemi (*Bursera simaruba*). Weeds and brush in mature citrus groves are also fenced and grazed. The taller, edible species, particularly pigeon plum and gumelemi are cut as bough during the dry season and fed. Gumelemi trees also double as living fence posts. Similarly, few producers concern themselves with scheduled parasite control and disease immunization programs which should improve overall flock performance and productivity.

These stressful conditions have resulted in the natural selection of an extremely hardy, adaptable and useful strain of sheep. Although quality of animals varies from farm to farm, many flocks contain large-framed individuals with a minimum amount of fleece and sound skeletal structure. The ewes are feminine, easy lambing, good milkers and excellent mothers. Furthermore, many individuals readily rebreed during lactation, and therefore produce two lamb crops per year. Limited technical information is available concerning the productivity of indigenous and exotic breeds of sheep under tropical conditions. Thus, it is essential that the performance of these sheep be documented under improved management conditions so as to allow productive sheep enterprises and to preserve valuable, locally adapted genetic resources.

A number of genetic and environmental factors contribute toward influencing ewe productivity and lamb performance. Fortunately, with the use of statistical and computer techniques, individual factors can be isolated and their relative effects on economically important traits can be determined. The objectives of the investigations reported herein were:

1. To compile the lamb growth and ewe productivity data collected at BARTAD from December, 1975 to July, 1977.

2. To document and compare the performance of indigenous and exotic breeds of sheep at BARTAD.

3. To evaluate the factors affecting the performance of lambs from Bahama Native ewes.

PROCEDURES:

The sheep phase of the animal science program began on December 11, 1974, when five pregnant ewes were obtained from the Central Agricultural Experiment Station, New Providence, for use in a bluetongue exposure trial. The ewes were held in quarantine under close observation for 21 days before being put with the cattle to begin the exposure period. The ewes and cows were together in excess of 21 days. At the end of this period, all animals were examined by a Ministry of Agriculture Veterinarian for indications of bluetongue and were pronounced free of the disease. Plans were made for further importation of sheep and additional ewes were secured from North Eleuthera flocks.

Bahama Native strain ewes and several imported, purebred Barbados Blackbelly and Barbados Blackbelly x Suffolk ewes were utilized in these investigations. All ewes were bred on a continuous basis to either Bahama Native or imported Barbados Blackbelly, Florida Native or Suffolk rams.

All sheep were permanently identified and their flock of origin and date of purchase recorded. In addition, each ewe was handled and visually inspected and the following items were noted:

a) age by mouth examination (ewes with oral abnormalities or without teeth were also noted).

b) feet and leg soundness (range of scoring: 1-17, with 10 being average).

c) muscling (range of scoring: 1-17, with 10 being average).

d) femininity (range of scoring: 1-17, with 10 being average).

e) udder (abnormalities were noted).

f) fleece (1 = very wooly; 17 = no wool and very loose hairy coat).

g) head color (white or pigmented were coded 1 or 2, respectively).

h) body color (percent of body pigmented was noted).

These phenotypic traits were then correlated to ewe productivity.

The ewes lambed on pasture without assistance. At birth, lambs were weighed, eartagged and docked. All ram lambs that were not retained for future breeding purposes were castrated at this time. Weaning took place when the lambs were approximately 3 to 4 months of age. Weaning weights were adjusted to 90 days of age and were also corrected for sex of lamb, type of birth and rearing, and age of dam, using adjustments recommended by the U. S. Sheep Industry Development Program (Scott, 1975). None of the lambs were creep fed.

Ewes were maintained exclusively on grass, legume, and legume-grass pastures. Pasture stands included such species as transvala digitgrass (Digitaria decumbens), guineagrass (Panicum maximum), green panicgrass (Panicum maximum var. trichoglume), buffelgrass (Cenchrus ciliarus), siratro (Macroptilium atropurpureum), glycine (Glycine wightii), green leaf desmodium (Desmodium aparines and alfalfa (Medicago sativa). All pastures were rotationally grazed and fertilized for maximum productivity according to the recommendations of the agronomy section.

Monosodium phosphate, a source of phosphorus without calcium, a trace mineralized salt mixture and water were provided free-choice. The trace mineral formula is presented in Table 1. This mixture was specially formulated by The Pennsylvania State University consultants to prevent the occurence of mineral imbalances and deficiencies in livestock at BARTAD.

All ewes, rams and lambs were subjected to a regular worming and disease immunization schedule that was designed by The Pennsylvania State University and Ministry of Agriculture Veterinarians.

Ewes were wormed at 8-week intervals with thiabendazole, loxon or tramisol. Anthelmintics were rotated to maximize control of parasites and to prevent development of resistant parasite strains. Mature sheep were given annual booster doses of Clostridium perfringens Types C and D toxoid to prevent outbreaks of enterotoxemia and were vaccinated against tetanus, blackleg, malignant edema and black disease. Lambs were vaccinated between 1 and 2 months of age against enterotoxemia, tetanus, blackleg, malignant edema and black disease, and with the combined Leptospira bacterins against Leptospira canicola, L. icterohaemorrhagia, L. grippotyphosa, L. hardjo and L. pomona. Lamb vaccinations were repeated 2 to 3 weeks following the initial series.

RESULTS AND DISCUSSION:

Representatives of the Bahama Native Sheep purchased and brought to BARTAD are best described as a nondescript "strain" with a large amount of phenotypic intra-population variation. The ewes are adequate in frame, feminine and heavy milkers. Mothering and flocking instincts of these ewes are excellent and well-developed. Fleece characteristics vary from heavily-wooled individuals to those with a pelage of hair resembling that of goats. Ewes are generally rather flat-muscled and dairylike in conformation with a carcass which is suggestive of relatively higher percent of internal pelvic fat than that which is observed in the traditional British mutton breeds. Visual evidence of imported breed influence is strong in some individuals and often is documented with records. For example, many ewes possess the color and conformation

TABLE 1. TRACE MINERALIZED SALT MIXTURE

Ingredient	Amount
Magnesium	3.00 pounds
Zinc	0.70 pounds
Manganese	0.56 pounds
Iron	0.20 pounds
Iodine	0.014 pounds
Copper	0.02 pounds
Cobalt	0.016 pounds
Selenium	0.0026 pounds
Vitamin A	15,000,000 I.U.
Plain Salt	200.00 pounds

peculiarities of the Barbados Blackbelly breed. Other ewes that are obviously larger, thicker and more rugged in their bone structure originated from the Central Agricultural Station, New Providence, where such imported breeds as the Wiltshire Horn and Cadzow Meat Improver have been used. It is therefore important to stress that the lamb growth and ewe productivity parameters reported in these investigations are merely indicative of the phenotypically diverse sample of native sheep imported to North Andros and evaluated at BARTAD.

Many factors influence lamb growth from birth to weaning at 90 days of age. Research reports indicate an average heritability of approximately 30 percent for this trait, attributing 70 percent of the variation to factors other than additive gene effects. Most of the variance in a trait unexplained by additive gene action can be attributed to environmental conditions. Such factors as the amount and quality of feed available, general state of health and interal parasite burden will influence animal performance. Similarly, traits related to ewe reproduction such as fertility, prolificacy and lamb livability to weaning are of low heritability and therefore, influenced to a great extent by the environment.

Effects of Year, Season and Source of Dam

The effects of year and season of birth and source of dam on the birth and 90-day adjusted weaning weights of lambs from native ewes are summarized in Table 2. Although lamb birth weights were similar from 1975 to 1977, large and significant ($P<.05$) differences between years were noted in 90-day weaning weights. An increase of 16 pounds per lamb occurred between 1975 and 1977. These encouraging, yearly increases were undoubtedly a reflection of improved nutritional regimes. While management, health and parasite control programs remained essentially the same during the 3-year period, pastures increased in number, became better established and more highly productive. These yearly increases in the quantity and quality of feed allowed a more adequate expression of the inherent genetic potential.

Season of birth had no effect on birth or weaning weights of lambs, indicating that adequate quantities of both pasture and supplementation in the form of hay and/or silage were available during the dry seasons. These results may not apply to Pilot Test Farm situations where insufficient pasture acreage and stored feed may be limiting factors.

Source of dam significantly influenced lamb birth and weaning weights. It is interesting to note this fact since all Eleuthera sheep were purchased from breeders in the same area that frequently cooperated with each other by exchanging rams. Lambs from the Central Agricultural Station (CAS) ewes were heaviest at birth and slightly heavier at weaning. Foundation ewes purchased from G. Albury weaned lambs that were significantly lighter ($P<.05$) than those from the CAS, D. Pinder, E. Higgs and Capt. R. Pinder flocks.

TABLE 2. EFFECTS OF YEAR AND SEASON OF BIRTH AND SOURCE OF DAM ON BIRTH AND WEANING WEIGHTS OF LAMBS FROM NATIVE EWES

Item	Birth Wt.		90-Day Weaning Wt.[1]	
	No.	lbs.[2]	No.	lbs.[2]
Year of Birth[3]				
1975	34	7.2	33	47.6[a]
1976	147	7.2	139	52.5[b]
1977	162	7.4	118	63.9[c]
Season of Birth[4]				
Wet (May-October)	161	7.4	119	57.5
Dry (November-April)	183	7.2	182	56.3
Source of Dam[5]				
CAS, New Providence	15	8.2[a]	11	61.3[a]
D. Pinder and E. Higgs, Eleuthera	64	7.6[ab]	56	60.8[a]
Capt. R. Pinder, Eleuthera	88	7.3[b]	77	57.8[a]
H. Albury, Eleuthera	61	7.2[b]	54	54.4[ab]
G. Albury, Eleuthera	88	7.4[b]	72	51.9[b]

[1]Corrected for sex of lamb, birth type and rearing, and age of dam.

[2]Means followed by different letters are significantly different from each other ($P<.05$).

[3]Weaning weights were adjusted for season, breed of sire and ewe source effects; birth weights were adjusted for season, breed of sire, ewe source and sex of lamb effects.

[4]Weaning weights were adjusted for year, ewe source and breed of sire effects.

[5]Weaning weights were adjusted for year, season and breed of sire effects; birth weights were adjusted for year, ewe source, breed of sire and sex of lamb effects.

Effects of Pasture Type and Season

Weaning weight records of lambs born and weaned from the same pasture type were sorted and analyzed to determine the interaction between pasture species and lamb performance. These data are summarized in Table 3. Clear differences were noted between the weaning weights of lambs from different pastures. Lambs weaned from legume-grass pastures were significantly ($P<.05$) heavier during both the wet and dry seasons than lambs from all other pasture types. The poorest performing lambs were from bullel grass, guineagrass and transvala digitgrass pastures. Data were available for between season comparisons from mixed legume-grass, greenleaf desmodium and guineagrass pastures. No significant differences were observed between seasons within pasture types, indicating that decreased dry season performance was not noted when animal numbers can be adjusted to the quantity of available forage.

Effects of Sex, Birth and Rearing Types and Age of Dam

Analyses were performed to determine the effects of sex, birth and rearing types, and age of dam on weaning weights of lambs from native ewes (Table 4). These results indicate that lamb sex and rearing type have significant ($P<.05$) influences on 90-day lamb weaning weights. Between sexes, no large differences were obtained for ewe and wether lamb weaning weights. However, ram lambs were significant ($P<,05$) heavier at weaning, an increase of more than 10 pounds over wether lambs. Rearing type differences were also significant ($P<.05$). Single reared lambs were 10 pounds heavier at weaning than those reared as twins. Triplet reared lambs were 15 pounds lighter than twins. Age of dam effects show trends similar to those reported for U.S. breeds. Heaviest lambs were weaned from ewes in the prime of their lives (3 to 6 years), while production was slightly but not significantly less for ewes less than 3 and over 6 years of age. The general trends observed indicate that standard lamb adjustments as recommended by the U.S. Sheep Indusrty Development Program (Scott, 1975) are adequate for these populations.

Effects of Breed of Sire and Dam

Records were analyzed to compare the performance of lambs sired by Native rams to those by imported Florida Native, Barbados Blackbelly, and Suffolk rams. These data are presented in Table 5. Breed of sire had a significant ($P<.05$) influence on both birth and weaning weights of lambs. Suffolk lambs were heavier at birth than those sired by Native, Florida Native or Barbados Blackbelly rams. At weaning, no significant weight differences were noted between Native, Florida Native or Suffolk sired lambs, but lambs sired by Barbados Blackbelly rams were significantly ($P<.05$) lighter.

The effects of breed of dam on lamb birth and 90-day weaning weights are also presented in Table 5. While only minor differences were noted in birth weights of lambs, breed of dam effects on weaning weights were non-significant, although rather large differences in the ewe breed averages were obtained. These data indicate that lambs sired by Native rams from Native ewes performed equally as well as those from imported breeding. Furthermore, addition of Barbados Blackbelly breeding resulted in a significant decrease in weaning weights.

TABLE 3. EFFECTS OF SEASON OF BIRTH AND PASTURE TYPE ON WEANING WEIGHTS OF LAMBS FROM NATIVE EWES

Pasture Type[1]	90-Day Weaning Wt.[2]	
	No.	lbs.[3]
Mixed Legume-Grass[4]		
Wet Season	31	68.7[a]
Dry Season	35	66.1[a]
Greenleaf Desmodium		
Wet Season	39	58.8[b]
Dry Season	21	59.6[b]
Buffel Grass		
Wet Season	11	54.8[bc]
Guineagrass		
Wet Season	4	50.4[bcd]
Dry Season	4	39.9[d]
Transvala Digitgrass		
Wet Season	12	49.4[cd]

[1]Weaning weights were adjusted for year and breed of sire effects.

[2]Corrected for sex of lamb, birth type and rearing, and age of dam.

[3]Means followed by different letters are significantly different from each other ($P<.05$).

[4]Legume dominant stands consisting of greenleaf desmodium, siratro, tinaroo glycine and green panicgrass.

TABLE 4. EFFECTS OF SEX, BIRTH AND REARING TYPES AND AGE OF DAM ON WEANING WEIGHTS OF LAMBS FROM NATIVE EWES

Item	90-Day Weaning Wt. No.	lbs.[1]
Lamb Sex[2]		
Ewe	150	50.6[a]
Ram	36	64.0[b]
Wether	113	52.6[a]
Birth Type[3]		
Single	141	51.3
Twin	146	54.5
Triplet	12	53.2
Rearing Type[4]		
Single	152	58.5[a]
Twin	135	48.5[b]
Triplet	12	33.9[c]
Age of Dam[5]		
2 years	40	50.5
3 years	50	55.3
4 years	69	54.5
5 years	44	51.0
6 years	75	52.9
7 years	14	50.8
8 years	5	53.5

[1] Means followed by different letters are significantly different from each other (P .05).

[2] Adjusted for year, sire breed, ewe source, age of dam, birth and rearing type.

[3] Adjusted for year, sire breed, ewe source, lamb sex, rearing type and age of dam.

[4] Adjusted for year, sire breed, ewe source, lamb sex, birth type and age of dam.

[5] Adjusted for year, sire breed, ewe source, lamb sex, birth and rearing type.

Ewe Classification

All ewes were aged by mouth examination and scored for feet and leg soundness, muscling, feminity, fleece, and head and body color. The statistical technique of multiple regression was used to correlate the above criteria to ewe productivity as measured by lamb weaning weight. No relationship was observed between ewe phenotypic features and the weight of their lambs. Therefore, within this population ewe conformation plays a minor role in determining lamb performance and should not be heavily emphasized in a selection program.

Overall Productivity

The overall productivity of Native ewes at BARTAD from December, 1975 to July, 197 is summarized in Table 6. Observations on 298 lambings and 278 weanings indicate that ewes will give birth to and wean 1.4 and 1.2 lambs per lambing, respectively. These data indicate that 85 percent of all lambs born were weaned. A 15 percent lamb mortality is commendable when one considers that most lambing occured unobserved and unassisted under what is essentially a range situation. These figures become more impressive when one considers that they were obtained on a total forage program without the use of concentrates.

Lambs weighed an average of 7.3 pounds at birth and 54.7 pounds at 90 days of age during the study period. These data indicate an average daily gain of 0.5 pound from birth to weaning for the lambs without creep feeding.

Records were available on a total of 141 lambing intervals indicating an average of 227 days between lambings (1.6 lamb crops per year) when rams are continuously with ewes. Using these figures, it can be estimated that the average BARTAD ewe weaned 1.9 lambs per year, weighing a total of 103.9 pounds.

CONCLUSIONS:

Sheep have the potential of being a successful livestock enterprise in the Bahamian mixed farming system. The following general conclusions and suggestions should be noted:

1. Performance of Native ewes and rams is equal to or better than introduced Barbados Blackbelly, Florida Native and Suffolk sheep. Therefore, future breeding programs should stress the use of Native stock, particularly by identifying and selecting the higher producing ewes and concentrating the most desirable seedstock in elite herds.

2. Selection programs should aim at improvement of ewe prolificacy and lamb rate of growth from birth to weaning, without sacrificing the ewe lambing interval. This can be accomplished by using fast-growing twin-born ram lambs from ewes with lambing intervals of 250 days or less. Ewe phenotypic characteristics should not receive a great deal of emphasis.

TABLE 5. EFFECTS OF BREED OF SIRE AND DAM ON BIRTH AND WEANING WEIGHTS OF LAMBS

Item	Birth Wt. No.	Birth Wt. lbs[2]	90-Day Weaning Wt.[1] No.	90-Day Weaning Wt.[1] lbs[2]
Breed of Sire[3]				
Native	100	7.5[a]	91	57.7[a]
Florida Native	78	7.5[a]	65	60.9[a]
Barbados Blackbelly	135	7.1[a]	128	53.8[b]
Suffolk	5	9.2[b]	5	66.8[a]
Breed of Dam[4]				
Native	344	7.3[ab]	290	57.3
Florida Native X Native	4	8.6[a]	5	59.4
Barbados Blackbelly X Native	16	6.5[b]	15	58.9
Suffolk X Barbados Blackbelly	10	7.6[ab]	6	50.8

1 Corrected for sex of lamb, birth type and rearing, and age of dam.

2 Means followed by different letters are significantly different from each other ($P<.05$).

3 Birth weights were adjusted for year, season, ewe source, sire breed and sex of lamb effects; weaning weights were adjusted for season and ewe source effects.

4 Birth weights were adjusted for year, season, ewe source, sire breed and sex of lamb effects; weaning weights were adjusted for year, season, ewe source and sire breed effects.

TABLE 6. PRODUCTIVITY OF NATIVE EWES AT BARTAD

Item	No.	Mean
Lambs Born/Lambing	298	1.4
Lambs Weaned/Lambing	278	1.2
Birth Weight, lbs.	343	7.3
90-Day Weaning Weight[1], lbs.	290	54.7
Lambing Interval, days	141	227

[1] Corrected for sex of lamb, birth type and rearing, and age of dam.

LITERATURE CITED

Scott, G. 1975. The Sheepman's Production Handbook. Sheep Industry Development Program, Denver. 214 p.