Productivity of Transvala digitgrass (**Digitaria decumbens**) and buffelgrass (**Cenchrus ciliaris**) with and without legumes utilized by native ewes in Bahamas*[1/]

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COMPENDIO

Cuatro tipos de pasturas se compararon en este estudio: Digitaria decumbens y Cenchrus ciliaris *con un aporte de 224 kg de N/ha/año (tratamientos T+N y B+N respectivamente) o en combinación con leguminosas tropicales (tratamientos T+L y B+L), las leguminosas empleadas fueron* Desmodium intortum, Glycine wightii *y* Macroptilium atropurpureum. *A cada uno de los cuatro tratamientos se le asignaron 15 ovejas de la raza indígena de las Bahamas. Al comparar el efecto del aporte nitrogenado en cada una de las gramíneas se observó una producción de materia seca (MS) significativamente mayor (P<0,05) en el tratamiento B+N que en el T+N. La producción de MS fue mayor en B+L (P<0,05) que en T+L y esta mayor que la de B+N. Los coeficientes de digestibilidad* in vitro *de la MS (IVDMD) en los tratamientos T+N, B+N, T+L y B+L fueron respectivamente 45,2; 55,3; 52,7 y 52.3 por ciento. La producción media proteica (CP) en kg/ha/año fue diferente en cada tratamiento. Estos resultados indican que los tratamientos a base de gramínea-leguminosa fueron superiores en calidad y cantidad de forraje. Los pesos y las ganancias diarias de peso de las ovejas en los tratamientos T+L y B+L fueron superiores a los de las ovejas en los tratamientos T+N o B+N. El porcentaje de corderos destetados por las ovejas T+L, B+L fue del 97,5 por ciento frente a 88 por ciento en el caso de las ovejas B+N y T+N. El intervalo medio entre partos en las ovejas T+L y B+L fue de 214 días y en las ovejas T+N y B+N de 246 días. La carga ganadera y la producción de cordero/ha/año de las pasturas a base de gramíneas-leguminosas fueron respectivamente 56% y 72% de las constituidas solamente por gramíneas y fertilizadas con N.*

Introduction

THE conditions prevailing on many islands of the Bahamas favor small ruminant production. Currently, sheep are reared on a few of these islands and, as in many parts of the world, the potential exists for increasing the viability of sheep production. Presently most Caribbean livestock farming is conducted on a relatively low management level. Available forages consist predominantly of edible brush, such as pigeon plum *(Cocolobis floridana)*, lignum vitae *(Guaiacum officinale)*, jumbey *(Leucaena glauca)* and gumelemi *(Bursera simaruba)*. Generally the forages are of low quality and the nutritional plane of the animals is not usually adequate for high performance. Overall productivity of native ewes can be improved with careful assessment of available animals, potential production capacity, and supporting management systems to insure maximum responses from sheep (4). Considering these factors, indigenous ewes should have a substantial increase in productivity if selected, improved tropical grass species, such as Transvala digitgrass *(Digitaria decumbens)*, buffelgrass *(Cenchrus*

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ciliaris) or legumes, such as greenleaf desmodium *(Desmodium intortum)*, tinaroo glycine *(Glycine wightii)* or siratro *(Macroptilium atropurpureum)* are used These species are available and have performed quite successfully in other areas of the tropics and in small plots in the Bahamas (6). The objective of this study was to determine the productivity of indigenous ewes grazing improved tropical grass and grass-legume pastures in the Bahamas

Materials and methods

Location, climate and soils. The site for this grazing study was the Bahamas Agricultural Research Station (BARTAD), Andros Islands. Andros has a climate of the tropical savanna type, with the average temperature for all months exceeding 17 8° C. Mean winter low and summer high temperatures are 21 1 and 27.8° C. Total precipitation averaged 1269 mm annually with the dry season beginning in November and lasting until April Mean annual precipitation and temperature ranges from 1974 through 1976 are presented in Table 1.

Table 1.—Meteorological data [1/]

Month	Precipitation (mm)	Temperatures (C°)	
		Maximum	Minimum
January	63.5	27 8	8 1
February	96 5	29.4	9 7
March	20 1	30 6	9 2
April	32 3	31 1	10 8
May	130 1	32 2	14 8
June	246 4	31 8	17.0
July	103 6	32 6	19 8
August	114 8	32 9	18 7
September	157.0	32 4	19 2
October	153 9	31 4	15.0
November	112 8	30.3	11 1
December	38 1	28 9	7.2
Total	1,268.7	Avg 30 9	Avg 13.4

1/ Data are 3-year averages (1974, 1975, 1976).

The study was conducted on oolitic limestone sediment soils formed during the Pleistocene Era (14). Soil test results indicated a pH of 7 8, phosphorus levels were low, potassium levels were low to medium, magnesium levels were medium and calcium was high (2). Initially the soils were essentially devoid of organic matter and very low in nitrogen.

Pasture species Two grasses, Transvala digitgrass and buffelgrass, were established alone and in mixture with a legume combination of greenleaf desmodium, siratro and tinaroo glycine Transvala digitgrass is a low-growing, creeping perennial that spreads by long trailing rooted runners and by spreading leafy flowering stems after rooting at the nodes. It is resistant to pangola stunt virus and sting nematode, two serious pests of pangola It is cold sensitive and relatively non-productive during the cold drier seasons of the year. It is also subject to damage by spittlebug and both stand and vigor of pure Transvala stands were reduced in this study by this insect Buffelgrass is a drought-resistant perennial grass established from seed It has a large, strong root system and tolerates heavy grazing once established It makes most of its growth in the summer and is only moderately cold tolerant The three legumes are trailing perennial legumes well suited to the climate and soils of the Bahamas (6)

Pasture clearing, establishment and sampling The area (6 5 ha) was cleared using bulldozers and other heavy equipment. All vegetation (grasses, forbs, brush, trees) was removed. This was followed by removal of large rocks, while smaller rocks were crushed and mixed with the soil The land was then disked and grid-rolled.

Iniatilly, fertilization was with 1338 kg/ha of an 8-18-8 (N–P_2O_5–K_2O) fertilizer containing the following micronutrients: magnesium, MgO, 6 75 per cent (sulfate-potash-magnesium); manganese, NMO, 1 70 per cent (manganese frit); boron, B_2O_3, 0.28 per cent (borax); copper, CuO, 0.93 per cent (copper sulfate); zinc, ZnO, 1.9 per cent (zinc sulfate). The pastures were then divided into four, 1.62-ha plots and established with the designated forage species. There were two grass and two grass-legume plots The Transvala digitgrass (vegetatively propagated) was spread by hand and lightly disked into the soil in early September. The buffelgrass pasture was seeded at the rate of 4 48 kg/ha. In the grass-legume pastures, the buffelgrass seeding rate was 2 24 kg/ha The legumes were innoculated and planted with a grass species between September 10 and 13. The seeding rates, dates and the specific grass or legumes are presented in Table 2. After establishment, all pastures received quarterly applications of machine-applied fertilizer Annual rates of 336 kg N, 336 kg P_2O_0 and 235 kg K_2O/ha were applied to the pure grass stands (Table 3). The grass-legume mixtures received the same annual rates of P_2O_5 and K_2O No nitrogen was applied to grass-legume mixtures Prior to initiation of the grazing trial, treatment blocks were fenced to allow rotational grazing. The pastures were not irrigated Composite forage samples of each treatment were taken prior to rotation to the next block Four random sites were chosen and strips 99 by 300 cm were cut with a sickle bar mower. All the cut forage was collected, weighed and dried at 60°C for 1 week Forage samples were ground in a Wiley mill (1-mm screen). The feeding value of the dried forage was determined using a modified Tilley-

Table 2.—Specific seeding rates used for grasses and legumes.

Item	Seeding Rate
Transvala digitgrass (*Digitaria decumbens*)[1]	Vegetatively propagated
Buffelgrass Alone (*Cenchrus ciliaris*)	4.48 kg/ha
Buffelgrass in Mixture	2.24 kg/ha
Greenleaf Desmodium (*Desmodium intortum*)	2.24 kg/ha
Siratro (*Macroptilium atropurpureum*)	2.24 kg/ha
Tinaroo glycine (*Glycine wightii*)	2.24 kg/ha

[1]Planted September 2 - September 4; all others planted September 10 - September 13

Terry two-stage *in vitro* DM digestibility (IVDMD) (1).

Animals and management practices. After the pastures were established, they were mowed and staged so as to be at a similar stage of maturity at the start of the trial. On June 17, 1976, 60 Bahama Native ewes and their lambs were weighed and randomly assigned to the nitrogen-fertilized grass and grass-legume treatments. Mean initial weight of the ewes was 44.5 kg. Two Florida Native rams (from University of Florida) and two Barbardos Blackbelly rams (from North Carolina State University) were added, one to each treatment and rotated between groups monthly. Number of grazing days and animal units were recorded. Each rotationally grazed block was visually appraised before rotation. Using the put and take system, (3) the number of animals on treatment were adjusted depending on forage availability. All ewes and their lambs were weighed at 28-day intervals, which coincided with a rotation period. Birth weights of lambs were recorded. Ram lambs not kept for breeding were castrated before they reached 1 month of age. Lambs were weaned at approvimately 90 days of age, with weaning on one of the weight dates. Free-choice monosodium phospate and trace mineral salt mixtures (Table 4) were provided to all animals. The sheep groups were wormed (Haloxon, Tramisol and Thiabendazole used in rotation) at the beginning of the pasture season (April), during the rainy period (July) and at the beginning

Table 4.—Elemental composition of trace mineralized salt mixture.

Elements	Amount
NaCl	90.7 kg
Magnesium	1.362.0 g
Zinc	317.8 g
Manganese	254.2 g
Iron	90.8 g
Copper	9.1 g
Cobalt	7.3 g
Iodine	6.3 g
Selenium	1.2 g
Vitamin A	15,000,000 IU

Table 3.—Fertilizer applications and rates

Date	Nitrogen (N)[1]		Phosphorus (P_2O_5)		Potassium (K_2O)	
	kg/ha	(source)	kg/ha	(source)	kg/ha	(source)
January 1976	56	(AMS)[2]	56	(0-46-0)	39	(0-0-22)
April 1976	56	(AMS)[2]	56	(0-46-0)	39	(0-0-22)
July 1976	56	(AMS)[2]	56	(0-46-0)	39	(0-0-22)
October 1976	56	(AMS)[2]	56	(0-46-0)	39	(0-0-22)
January 1977	56	(AMS)[2]	56	(0-20-15)	39	(0-20-0)
April 1977	56	(AMS)[2]	56	(0-20-15)	39	(0-20-0)
	336.3 kg/ha		336.3 kg/ha		235.4 kg/ha	

[1]Nitrogen levels were applied to pure grass stand only.

[2](AMS) Ammonium sulphate N carrier.

of the dry season (November). Lambs were wormed on the same schedule beginning at approximately 1 month of age.

Data analysis. The forage date collected were analyzed using the analysis of variance random block design (18). Ewe and lamb performance data were analyzed using the least squares method (7). When significant effects were observed between the means, Duncan's Multiple Range Test was applied (20).

Results and discussion

Dry matter yields. The total dry matter (DM) yields of the two grass stands (T+N, B+N) were different ($P<0.05$; Table 5). Total DM yields were 8.2 and 10.3 ha/year for T+N and B+N, respectively. Similar yields were reported by in an earlier study (16), although the levels of nitrogen (N) applied to the grass stands in the present study was approximately three times greater than used previously. The greater N requirement per unit of DM produced could be due to lack of fertility and the relatively poor water- holding capacity of the soils in the present study.

Total DM yields from Transvala digitgrass and buffelgrass, each mixed with the same legumes (T+L, B+L) were 13.7 and 15.2 mt/ha/year,* respectively ($P<0.05$). The upper yields for the grass-legumes reported herein are similar to the lower limits reported earlier (11).

The mean 28-day DM yields for T+N, B+N, T+L and B+L were 1.17, 1.29, 1.52 and 1.69 mt/ha. DM production during the drier periods (November-April) for T+N, B+N, T+L and B+L were 39, 48, 37 and 41 per cent, respectively, of the total DM produced. Buffelgrass was slightly more productive in the drier periods.

Digestible energy production. The mean percent IVDMD ranged from 45.2% for T+N to 55.3% for B+N (not presented in tables). Means of monthly T+N samples ranged from 24.3% in January (dry season) to 64.6% in June (wet season). The B+N treatment had less seasonal variation ranging from 62.7% in June to 47.6 and 47.8% in August and January, respectively. The means for B+N were similar to those obtained in an earlier study (17).

* mt = metric tonne.

Table 5.—Dry matter (DM) and digestible DM (IVDMD) production of transvala (T+N) and buffelgrass (B+N) pastures fertilized with nitrogen (N) or interplanted with legumes (L) [a]

Date	Dry Matter (mt/ha) [b]				Digestible Dry Matter (kg/ha) [c]			
	T + N	B + N	T + L	B + L	T + N	B + N	T + L	B + L
June 18, 1976	0.67def	0.49ef	0.97 d	0.78de	417 def	304ef	654d	466de
Aug 10, 1976	2.17d	1.73de	1.61ef	1.61ef	1177d	817e	756ef	737ef
Sept. 11, 1976	0.74f	1.32def	1.93de	1.93d	313f	801de	1018de	1051d
Jan. 4, 1977	1.57de	1.55de	0.81f	1.73d	623f	840d	443e	922d
Jan. 27, 1977	1.05ef	1.61d	1.37de	1.03ef	254g	774d	591e	476ef
Feb 24, 1977	0.65ef	0.99de	0.90def	1.37d	188f	507de	467def	701d
April 21, 1977	—	0.81e	2.11d	2.06d	—	499e	1155d	1146d
May 19, 1977	—	—	2.05e	2.47d	—	—	1011e	1251d
June 16, 1977	1.37ef	1.84def	1.95de	2.24d	877d	1064	1028d	1194d
Total	8.22	10.34	13.69	15.22	3850	5606	7122	7944
Means	1.17g	1.29f	1.52e	1.69d	550g	701f	791e	883d

[a] Each value was the means of four sub-samples

[b] L S D @ 0.05 for DM in chronological order with dates were: 0.42; 0.42; 0.66; 0.22; 0.41; 0.58; 0.35; 0.31; 0.68.

[c] L S D @ 0.05 for kg IVDMD in chronological order with dates were: 266.6; 206.1; 318.0; 117.5; 176.4; 291.0; 192.3; 158.5; 378.7.

[defg] Means with different superscript, within line, within character, were significantly different ($P<0.05$).

Animals were not on treatments due to lack of forage production

IVDMD means for the two grass-legume treatments were very similar Seasonal IVDMD distributions for T+L ranged from 67 0% in June to 43.0% in January. The range for B+L was 59 7% to 46.4% in June and January, respectively. The grass-legume pasture were legume dominant (85%), as reflected by IVDMD means which were similar to values previously reported for legumes (12).

Regardless of the variation observed in IVDMD percent, total kg DDM/ha for each treatment followed the same trend as did DM yields (Table 5). T+N produced significantly less kg DDM/ha than did the other treatments The greatest yield of kg DDM/ha was produced by the B+L mixture During the wet season (May-October) T+L produced 79% of its total annual digestible DM However, B+N produced more digestible DM during the dry season (November-April) than did the other treatments Similar dry season performance of buffelgrass has been reported (8, 10)

Crude protein production. Mean crude protein (CP) ranged from 7.7% for T+N to 16 4% for the T+L treatment (not presented). CP values obtained for T+N are below the minimum values required for maintenance and growth of most animals (19). There were only two sampling periods (August and January) in which T+N was not extremely low in CP. The B+N treatments had a mean CP of 8 49%.

Mean CP percent for the grass-legume treatments were quite similar, 16 40 and 16.07% for the T+L and B+L treatments, respectively Only once was CP percent less than 13% for both treatments and that was during late January. Nitrogen should not have been a limiting factor in terms of animal response on either grass-legume block

The trend for crude protein yields (kg/ha) was the same as that of the DM and IVDMD yields (Table 6) The greatest amounts of CP were produced by the grass-legume pasture treatments during the wet season. CP mean monthly yields were 98, 110, 250 and 282 kg/ha and were different ($P<0\ 05$) for T+N or B+N vs T+L or B+L ($P<0\ 05$). Corresponding total CP yields were 685, 882, 2252, and 2534 kg/ha, respectively. Similar results were observed in a previous study (13).

Ewe maintenance and performance. The mean weights of the native ewes are presented in Table 7. Initial ewe weights, date of first lambing, number of lambs and age of ewe were held constant statistically to control the effects of these variables on the results There were no significant differences among the treatments during the first 84 days of the trial This was probably because all the groups had ample forage available However, after the initial 84 days, differences ($P<0\ 05$) in ewe weights were apparent. Mean ewe weights on grass-legume treatments were heavier than ewe weights on pure grass treatments Increased animal weights and gains were also observed from legumes in mixed pastures (9) Mean ewe weights over the entire trial on T+N, B+N, T+L and B+L were 46.6, 50.5, 54.6 and 55.5 kg, respectively ($P<0.01$) These weights are heavier than those reported for mature Barbados Blackbelly ewes (5).

Table 6 —Crude protein production of transvala — (T+N) and buffelgrass (B+N) pastures fertilized with nitrogen (N) or interplanted with legumes (L).[a]

Date	CP (kg/ha)[b]			
	T + N	B + N	T + L	B + L
June 18, 1976	35d	30d	155c	103c
August 10, 1976	210cde	86f	265c	260cd
Sept. 11, 1976	50f	142e	313cd	334c
Jan. 4, 1977	179d	179de	136f	298c
Jan 27, 1977	56f	157c	126cd	101de
Feb. 24, 1977	48e	70e	179d	241c
April 21, 1977	—	87e	402c	364cd
May 19, 1977	—	—	360d	423c
June 16, 1977	104e	131e	315d	410c
Total	685	882	2252	2534
Means	98f	110e	250d	282c

[a] Each value was the means of four sub-samples

[b] L S D @ 0 05 for kg of CP in chronological order with dates were: 53 6; 60 1; 66 4; 34 6; 37 4; 89 0; 63 6; 54.6; 91.5.

[cdef] Means with different superscript. within line, within character were significantly different ($P<0\ 05$)

—Animals were not on treatments due to lack of forage production

Lamb performance in the respective treatments is presented in Table 8 Mean lamb birth weight on the grass-legume pastures was slightly lighter but not significantly different on pure grass stands Prolificacy of ewes on grass vs. grass-legume pasture was also similar However, ewes on grass-legume treatments had a mean weaning percentages of 97 5% vs. 88 7% for ewes on grass pastures. Similar weaning percentages were observed in an earlier study (15). The Transvala pasture had the highest mortality rate to weaning (13 6%) compared to 2 3% for the buffelgrass-legume pasture. Adjusted 90-day weights were not significantly different among the treatments; however lambs on the grass-legume blocks were slightly heavier at weaning. This was apparently the result of a greater lactating ability of the ewes on the higher quality pastures. Mean weaning ages for the T+N, B+N, T+L and B+L treatment groups were 103, 97, 90 and 85 days, respectively.

Table 7.—Ewe weights (kg; Nº observations) of transvala (T+N) and buffelgrass pastures (B+N) fertilized with nitrogen (N) or interplanted with legumes (L).

Dates	T + N		B + N		T + L		B + L	
June 17, 1976 (initial)	44.8	(13)	43.7	(15)	45.2	(15)	44.2	(14)
Sept. 9, 1976	46.2	(13)	50.8	(12)	51.5	(15)	49.1	(14)
Dec. 2, 1976	43.9b	(12)	47.1b	(12)	53.4a	(15)	53.3a	(14)
Feb. 24, 1977	—	—	54.4	(12)	50.7	(15)	56.1	(14)
May 19, 1977	—	—	54.3	(5)	62.1	(15)	62.7	(13)
July 14, 1977	54.7bc	(5)	54.0c	(5)	64.3ab	(15)	65.1a	(14)
Trial Avg.	46.6c	(11)	50.5b	(11)	54.6ab	(15)	55.5a	(14)

[abc] Means with different superscripts within the same date were significantly different ($P<0.01$).

—All animals removed from treatment due to lack of sufficient forage.

Table 8.—Mean productivity of ewes on transvala (T+N) or buffelgrass (B+N) pastures fertilized with nitrogen (N) or interplanted with legumes (L).

Item	T + N	B + N	T + L	B + L
Birth weight, kg	3.4	3.3	3.2	3.2
Lambs born/lambing	1.25	1.44	1.42	1.29
Lambs weaned/lambing	1.08	1.31	1.38	1.26
%lambs weaned	86.4	91.0	97.2	97.7
% mortality to weaning	13.6	9.0	2.8	2.3
% single birth	48.0	40.4	35.1	55.6
% twin birth	52.0	59.6	59.6	44.4
90-day weaning wt., kg	21.7	23.5	25.5	24.7
Mean age at weaning, days	103	97	90	85
Lambing interval, days	245	246	214	284a
Expected lamb crops/2 yrs	2.98	2.97	3.41	2.60
Lamb produced, kg/ha/yr	167	305	555	350

[a] Mean large because of two ewes each lambing once during the trial; mean of 214 days if two ewes excluded.

Ewes on the T+L mixture had a mean lambing interval of 214 days. Similar results were reported using Dorset X Barbados ewes (5). Mean lambing intervals of ewes on the two grass treatments were almost identical at 246 days. The mean lambing interval of ewes on the B+L pasture (284 days) was greater than for ewes on grass pastures. This was primarily due to two of the ewes on the latter treatment only lambing once during the trial; if these two ewes are excluded from the data, the mean for the B+L treatments was 214 days. Since the legumes in the two grass-legume mixtures were the same and quite dominant, it is unlikely that this is a real treatment effect, but more likely a result of sampling error.

From the data obtained, the mean amounts of lamb produced per hectare of Transvala digitgrass and buffelgrass, with nitrogen or with legumes, were 167, 305, 555 and 350 kg, respectively. Annual lamb production per hectare of the grass-legume pastures was 72% greater than the grass pastures. The production capability of Transvala digitgrass should have been appreciably increased if insects were controlled more effectively, since infestation with spittlebug apparently decreased the yield of Transvala digitgrass, whereas yield of buffelgrass did not appear to be affected by insects.

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Notas y Comentarios

Control biológico del áfido de los invernaderos

Los botánicos pueden haber desarrollado por fin un medio eficaz para erradicar una de las más persistentes plagas de los invernaderos, *Myzus persicae*, el pulgón del melocotonero.

El *Myzus persicae* ataca a una variedad de cultivos, y es especialmente difícil de controlar en invernaderos comerciales de crisantemos. Cuando está en números pequeños disperso por toda la planta, hace poco daño, pero en el invernadero cálido y húmedo, se multiplica rápidamente y ataca las flores, haciéndolas invendibles. Los insecticidas son sólo parcialmente eficaces, porque los áfidos se concentran en el envés de las hojas donde es difícil que lleguen las aspersiones.

R. A. Hall y H. D. Burgess, del Instituto de Investigaciones de Cultivos de Invernaderos en Littlehampton, Inglaterra, se tropezaron con el *Verticillium lecanii*, un hongo tropical relacionado a un patógeno vegetal que causa marchitez en el tomate y el algodón. El *V. lecanii* se sabe que ataca a los insectos tropicales, de tal manera que Hall y Burgess lo cultivaron en una solución nutritiva y asperjaron las esporas fungosas a unos crisantemos de invernadero muy susceptibles al ataque del áfido (*Annals of Applied Biology*, vol 93, p 255). Dos factores favorecieron al hongo. Uno es la alta temperatura y humedad del invernadero; el otro fue que *Myzus* es un insecto inquieto. Aun infectado, deambula entre sus hermanos esparciendo la enfermedad, de tal manera que hasta las aglomeraciones debajo de las hojas eran atacadas mortalmente.

Los resultados han sido espectaculares. En algunos casos los áfidos han desaparecido completamente, aunque el éxito con un par de plagas menores no ha sido parejo. Pero Hall y Burgess esperan que las pruebas que están haciendo en la actualidad confirmarán sus resultados, y que tendrán éxito con las plagas menores.

Problemas económicos en el cultivo de la jojoba

Con el anuncio de que la Cetus Corporation, de California, está aplicando la ingeniería genética para producir mediante bacterias modificadas un sustituto al aceite de cachalote, ha resaltado el hecho de que el aprovechamiento de la jojoba (*Simmondsia chinensis*, Buxaceae), otra alternativa para salvar al cachalote de la extinción, todavía tiene varios problemas para su desarrollo.

En el sudeste de Estados Unidos y en México se han sembrado ya más de 1800 hectáreas con jojoba. Pero poco de estas plantaciones están lo suficientemente maduras como para comenzar a producir aceite: la jojoba necesita cinco años para madurar, lo que no contribuye a bajar los costos. Así, nadie está seguro como resultarán las economías de gran escala.

La meta es un precio de US$ 1 por 5 libras de aceite de jojoba. Esto puede resultar optimista. Para conseguir ese objetivo, es necesario resolver dos problemas. El primero es encontrar un método mecanizado de cosechar las semillas. Aquí la respuesta puede residir en modificaciones a las máquinas convencionales recogedoras de uvas. El segundo problema, la extracción del aceite de las semillas, es más duro.

Las prensas pueden extraer fácilmente el primer 50 por ciento del aceite. Pero la extracción química es indispensable para obtener el resto, y, hasta ahora, ha habido problemas para eliminar el solvente residual de la harina molida. Esto es importante, porque la harina tiene un contenido de 30 por ciento de proteína y los productores de jojoba están pensando venderla como alimento animal.

Pero ellos están optimistas de que estos problemas pueden ser dominados, digamos en unos cinco años. Si esto resulta así, calculan que la jojoba no sólo suministraría alimento animal y aceite para la industria, sino también el primer aceite para freír de cero calorías.

Los jardines botánicos y la supervivencia de especies

Una visita de Thor Heyerdahl a la Isla de Pascua (Chile) hace 25 años, y la publicación en 1978 del libro "Plant Red Data Book", por la Unión Internacional para la Conservación de la Naturaleza (IUCN), han conducido al redescubrimiento del único árbol de la isla, que por 20 años se creyó extinguido. El árbol *Sophora toromino* (Leguminosae) es peculiar de la Isla de Pascua y proveyó a los nativos con su sola fuente de madera para la armazón de sus casas, canoas y sus famosas tallas de madera. La introducción en el siglo 18 de ovinos significó la gradual extinción del toromino. Los rebaños que pastoreaban descortezaban los árboles adultos y devoraban las plantas jóvenes en tal forma que en 1917 sólo quedaba un ejemplar. Unos pocos más fueron vistos en 1955, pero en 1962 no se pudo encontrar un sólo árbol y *S. toromino* fue registrado en el "Plant Red Data Book" como extinto.

Sin embargo, Thor Heyerdahl en uno de sus viajes a la Isla de Pascua había colectado algunas semillas y las había depositado en el Jardín Botánico de Gotemburgo, en Suecia. En setiembre de 1979, el Comité de Plantas Amenazadas, una rama del IUCN, recibió una carta del Profesor Per Wendelbo de la Universidad de Gotemburgo en la que informaba que las semillas de Heyerdahl habían germinado y que tenían tres plantas de *S. toromino*. El Comité está ahora contemplando la posibilidad de reintroducirlo a la Isla de Pascua.

Otra especie recientemente reencontrada fue *Bromus interruptus*, una gramínea británica, vista por última vez en 1972 en Cambridgeshire. El Dr. Philip Smith, de la Universidad de Edimburgo, tenía esta planta en su colección, y no tenía idea que los suyos eran los únicos especímenes en existencia hasta que leyó el "Plant Red Data Book". Ahora está distribuyendo semillas a otros jardines botánicos.

Estos dos casos destacan el papel de los jardines botánicos en conservar plantas amenazadas o raras. Un primer paso para alertar a los curadores sobre la significancia global de ciertos ejemplares en sus colecciones ha sido el "Plant Red Data Book" con su censo de plantas amenazadas. Aunque no fue producido principalmente para los jardines botánicos, proporciona indicaciones de cuáles plantas son aconsejables para tratar de cultivarse para que sobrevivan como especies.

El Comité de Plantas Amenazadas está siguiendo estos éxitos con el establecimiento de un registro mundial de plantas en extinción que se mantienen en jardines botánicos de todo el mundo, para así estimular el intercambio de información y de semillas.

Agro-Forestry. Con fecha enero de 1980 ha aparecido el primer número de *Agro-Forestry*, un boletín semestral destinado a temas agroforestales que se distribuye gratuitamente entre los científicos y técnicos involucrados en el campo agroforestal. Está patrocinado conjuntamente por la Universidad de las Naciones Unidas (UNU), la Unión Internacional de Organismos de Investigación Forestal (IUFRO), y el Centro Agronómico Tropical de Investigación y Enseñanza (CATIE). En el primer número hay información sobre el Taller sobre Sistemas Agroforestales en América Latina, organizado por la UNU, del cual ya se ha publicado el volumen con los trabajos y resoluciones. Se da cuenta, además, del Servicio de Información y Documentación Forestal, que ha creado el CATIE, con el apoyo del gobierno suizo y que está a cargo de Humberto Jiménez Sáa; y también de la Conferencia Internacional sobre Cooperación Internacional en Agroforestería, celebrado en Nairobi, en julio de 1971. Tiene también sendas listas de participantes a esos dos certámenes internacionales. Los editores son Gerardo Budowski y Humberto Jiménez Sáa y la dirección: Editores de Agro-forestry, CATIE, Turrialba, Costa Rica.