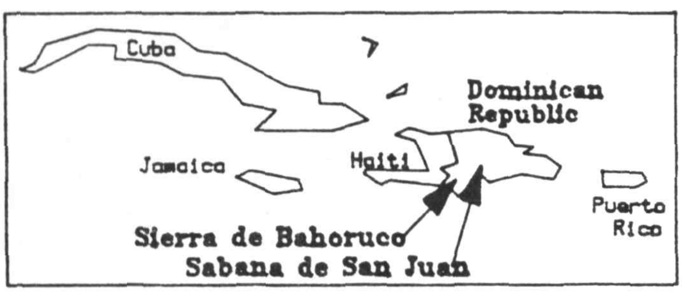
A Range Program in the Dominican Republic?

Gary S. Kemph and Melvin Koelling

Expatriate advisors to agricultural ministries overseas, sometimes referred to as "international extension agents," are often asked to assist in the definition of program goals and priorities. To make informed decisions on goals and priorities, administrators utilize the best information available to them at the time a decision must be made. If their information is good, the decision will likely be good, and vice versa. In most developing countries basic data are rudimentary, totally absent, or, worse: just plain wrong. The information derived from processing these data is usually proportionately wrong.

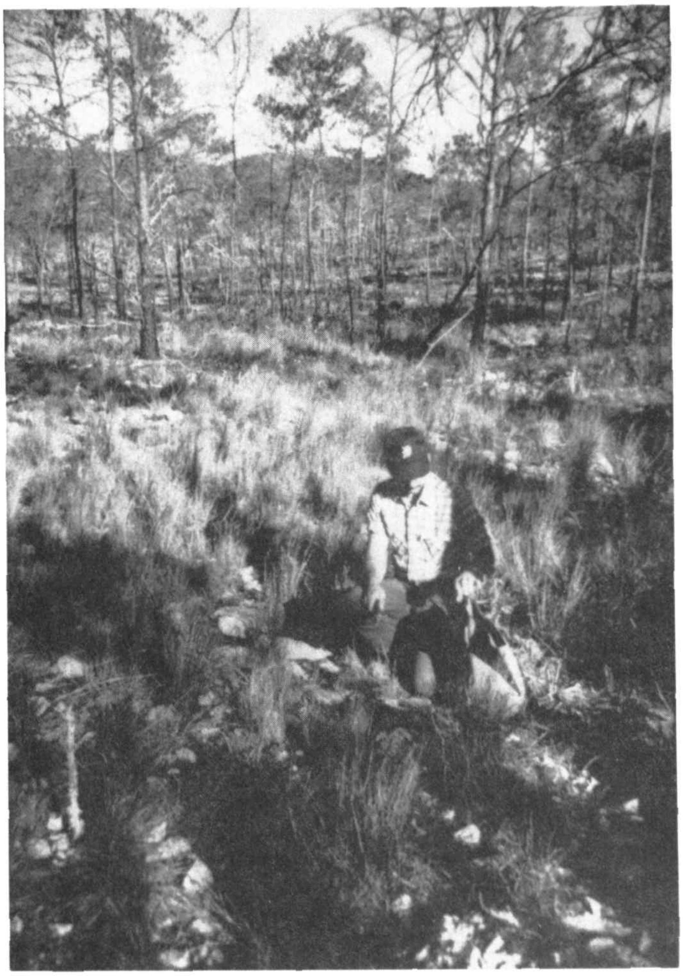
How can an advisor get government officials, who are heavily preoccupied with daily political brushfires, to understand the value of the unique and often abundant range resource so that its development can be weighed intelligently against other pressing funding needs? The advisor's obvious response to this question is to go out and get the data, study it and present it to administrators in a form they will read and understand. Simple, you say? Administrators frequently will not fund a study because they do not understand what rangeland is, yet they cannot understand what rangeland is until they fund the study and absorb the results. These administrators typically are steeped in a tradition which dictates that "if you can't farm it, it's wasteland."

This was the dilemma facing us in the Dominican Republic while serving as advisors to the Agricultural Secretariat in 1985. The immediate solution was to conduct reconnaissance of range development potential on



Forage Study Sites in Dominican Republic.

the coat tails of a much larger regional multiple use study. The feeling was that if the results of the initial study were favorable, administrators might be willing to support a more in-depth and scientifically sound range inventory and livestock development study at the national level. Because it was fast and cheap, the study did not require



Sierra de Bahoruco stony site.

the Secretary's approval, and it was done on a basis timely enough to be incorporated in the overall multiple use report.

Study Area

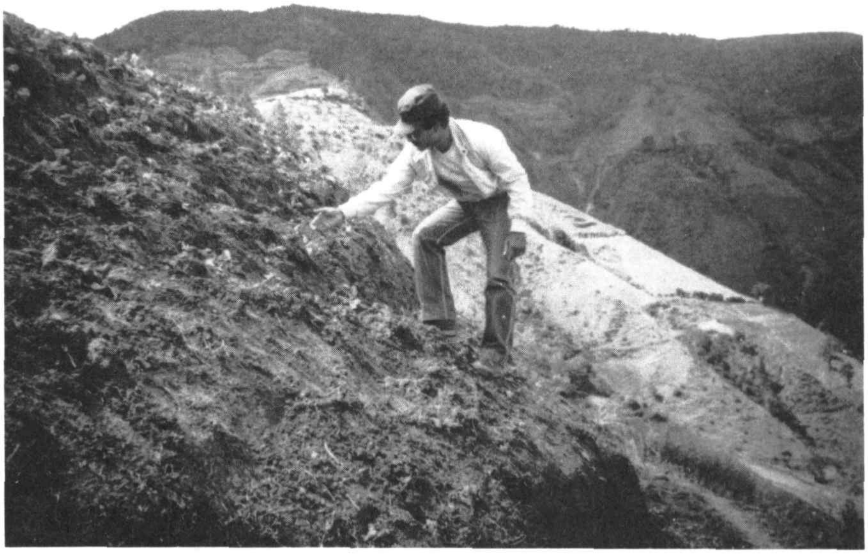
The forage survey areas covered about 90,000 km^2 in the Sierra de Bahoruco and Sabana de Juan in the relatively isolated and mountainous western part of the Dominican Republic. Elevations varied from 1,200-2,000 m and annual precipitation from 1,000-1,800 mm. Natural vegetation was predominantly Caribbean pine, *Pinus occidentalis,* with an understory of mixed hardwoods and bunchgrasses. Migration of land-hungry farmers from the lowlands since the early 1960s had resulted in the removal of about 10 percent of the forest vegetation in the Sierra

Authors are economist-management, Texas Agricultural Extension Service, Corpus Christi, Texas, and professor of forestry, Michigan State University, East Lansing, respectively. Research referred to in the article was funded by the U.S. Agency for International Development and the Dominican Republic.

de Bahoruco and 70 percent in the Sabana de de San Juan area.

Purpose and Procedures

Just prior to the forage study, a much more comprehensive forest resources inventory of the areas was initiated. **The specific purpose of the forage inventory** was to obtain, in one week, a preliminary assessment and quantification of the potential to produce forage usable by livestock on the forested areas. There were no soils or rainfall maps available, so, where possible, the forage inventory was to be done by forest cover density classes. The density classes were determined from aerial photographs and were used concurrently in the forest inventory. In addition, constraints on use of the area for forage production and factors which would affect management were identified. The quantified inventory data was used in the multiple use economic analysis of the two areas.



Sabana de San Juan, steepslope farming in cutover pine area.

Experience indicates that on forested land, forage production generally increases as tree overstory decreases. **Thus, for the Sierra de Bahoruco region** a copy of the forest type-density map prepared by Michigan State University was used to stratify the forage sample locations. This map identified and classified forest vegetation by forest type (broadlead, pine, savannah, and mixed pine-broadleaf). The pine type was separated further into four density classes based on extent of crown cover. These four classes were identified as P0 (less than 10 percent crown cover), P1 (10 to 39 percent crown cover), P2 (40 to 69 percent crown cover), and P3 (70 percent or more crown cover). Areas where the slope of the land exceeded 60 degrees (120 percent) were identified as inaccessible.

Mountainous terrain of the Sierra de Bahoruco

The sampling procedure was to survey the accessible parts of the region and to make comparisons among the respective types and density classes. Then, representative forest stands were selected and a 1-meter square quadrat in each selected stand was clipped of all usable forage. These samples were placed in a paper bag and identified as to site. They were air dried for a week and then weighed. These sample weights were used to estimate total annual forage production for each forest stand by type and by density class. In addition to collecting the standing forage, a description of the particular stand was made, noting such variables as species, fire history, soil condition, slope, and other appropriate ecological and management related factors. Photos were taken of each type/class. A total of 12 quadrats were clipped. The number of plots sampled generally was proportional to the forage production of the type-density class represented. After initial fieldwork, the type-density classes were substratified according to degree of soil stoniness.

For the Sabana de San Juan area a forest type-density map was not available. Since this area was not as well defined nor as accessible as the Sierra de Bahoruco region, sampling was more difficult. A rough assessment of forage potential in this region was made from the

Table 1. Current stocking capacities for differing pine density classes and soils in the Sierra de Bahoruco.

	Stony Soils			Non-Stony Soils			Total	
Class	AU/ha/yr	Ha	AU/yr	AU/ha/yr	Ha	AU/yr	Ha	AU/yr
P0,P1	0.3	15896	4770	0.4	7948	3180	23844	7950
P2,P3	0.3	8915	2674	1.4	4457	6240	13372	8914
TOTAL		24818	74444		12405	9420	37216	16864

results of a few selected plots and general observations. Management concerns were noted.

Results

Results in the Sierra de Bahoruco region indicated that forage was present only in the four pine density class forests. Vegetation in the mixed pine-hardwood and broadleaf areas was too dense to permit significant herbaceous growth which could be utilized as forage. The savannah areas were insignificant with respect to size and probably will be overused continually due to favorable topography. The two dominant forage species were *Andropogon urbanianus*, a bluestem grass, and *Danthonia domingensis,* an oatgrass. Annual forage production was estimated to run from negligible on the stony P0 (open) site to 10,500 kg/ha on the non-stony P2 (half forested) site. Corresponding stocking rates, assuming a daily requirement of 10 kg of dry forage per animal unit (AU) and "proper use" levels of utilization (leave half of vegetation by weight at end of rainy season), ran from zero to 1.4 AU/ha/yr for cattle (Table 1).

These calculations indicate that the Sierra de Bahoruco had current forage production sufficient to support nearly 17,000 AU per year—if water sources could be developed. Assuming an AU could produce an average of about 300 pounds of beef per year (lb beef = 60% lb liveweight), the Sierra de Bahoruco could produce a total of about 5 million lb of beef annually. This amounted to 25% of the Dominican Republic's 1985 red meat export quota to the U.S. of 20 million pounds. Assuming an FOB price of US$1.20/lb, the Sierra de Bahoruco could provide about US$6 million annually in foreign exchange.

It should be noted that these figures represent actual forage availability under then-current management conditions (i.e., no tree cutting, uncontrolled fires). Once specific management objectives have been established, these figures should be reevaluated.

Management concerns identified for the Sierra de Bahoruco included the following:

1. Availability of water for livestock is an absolute limiting factor in obtaining full utilization of forage on the area. Present water sources are of seasonal value only. Additional water developments must be made before any more than localized forage use can be obtained.

2. Use of controlled fire can be an important management tool. Coordination between management of the forest for timber and management for forage must be developed since periodic controlled burns could favor production but adversely affect pine regeneration. Continued uncontrolled fires will be detrimental to both pines and forage plants.

3. Heterogeneity of sites and very limited water availability imply the need for relatively few large grazing allotments, rather than a large number of small allotments. Allotment size will have to be variable to produce equal amounts of forage.

4. Forage production varies considerably within the P1 and P2 forest density classes. Largely, this fact reflects soil depth and moisture relationships. This implies that grazing allotments will have to be variable in size to produce equal amounts of forage.

5. Diversity of forage types (grasses, herbs, shrubs) indicates that sheep and goats, as well as cattle, could be produced. A demand analysis for these classes of livestock would need to be made before a decision on their incorporation is made.

6. Physical developments to control grazing allotments among individuals will probably be minimal since the availability of inexpensive labor will allow the use of herders or riders to regulate livestock distribution. Branding of animals should facilitate labor intensive herd management.

7. Transportation costs for moving livestock and other forest products to market could be prohibitive and need to be studied in detail before final development plans are made.

Results in the Sabana de San Juan indicated that forage production potential per unit area was greater in this region than in the Sierra de Bahoruco. This is a reflection of deeper soils which have better soil moisture relationships. However, due to encroachment and existing small farms within the region, the potential for extensive livestock production may be less. Annual forage production was estimated at 5,300-13,400 kg/ha for the three dominant species: *Andropogon urbanianus, Danthonia domingensis,* and *Melinus minutiflora* (molassesgrass). Proper use stocking rates were estimated at 0.7-1.8 AU/ha/yr. Forage production was limited not by the capacity of the area to produce but by the existing uses of the land. The many small farms and settlements scattered throughout the region would seriously affect the development of large grazing allotments. While it is possible that several small cooperative allotments could be developed for those farmers already in the area, this is unlikely unless they can be persuaded to abandon their efforts at independent crop production and become small ranchers or livestock producers. This conversion, if possible, would probably require considerable extension effort and skill.

Principal differences between the two areas are the much greater degree of farmer incursion into the Sabana de San Juan area, resulting in less available forage, and the better possibilities of developing wells or small impoundments there than in the porous soils of the Sierra de Bahoruco. In contrast to the Sierra de Bahoruco, where limitations on forage production reflect physical conditions, limitations on forage production and utilization in the Sabana de Juan reflect social conditions. Forage on rangeland or grazable forestland must be developed within an agroforestry context in Sabana de San Juan before large scale livestock production can be given serious attention.

Recommendations for followup work included studies of hydrology, fire-vegetation interactions, soils-elevation interactions, seasonal variations in forage nutrient content, potential for increased grazing capacity of broadleaf and mixed pine-broadleaf areas, wildlife as affected by uncontrolled hunters and dogs, and inaccessible areas and their possible uses. Emphasis was placed on the need to analyze transportation system development feasibility and costs.

Has the Forage Study Contributed to an Improved Range Program?

The forage study was distributed to key public and private sector decisionmakers, and its results were presented at national and international natural resources management seminars held in the Dominican Republic in 1986. A second reconnaissance survey covering more of the drier, non-mountainous rangeland in the western part of the country subsequently was authorized by the Secretariat. Two workshops were held to train soil conservation service technicians in range site identification and forage inventory techniques. Efforts were begun to catalog well log data to correlate groundwater availability with grazing sites. A scholarship was funded in 1987 for a Dominican graduate student in range management, the first in the country's history.

Finally, the undersecretary, who as a result of the forage study had just begun to appreciate the potential of the range resource, was fired. His successor has a favorite motto: "Gentlemen, if you can't farm it it's wasteland."

A step towards a better range program for the Dominican Republic had been taken, but progress was evident only after the higher mathematics of the situation had been assessed: Two steps forward, one backward. Such are the vagaries of international advisory work.

Current Literature

This section has the objective of alerting SRM members and other readers of *Rangelands* to the availability of new, useful literature being published on applied range management. Readers are requested to suggest literature items—and preferably also contribute single copies for review—for including in this section in subsequent issues. Personal copies should be requested from the respective publisher or senior author (address shown in parentheses for each citation).

Absorption, Translocation, and Metabolism of Picloram and 2,4-D in Leafy Spruge *(Euphorbia esula)*; by Rodney G. Lym and Kevin D. Moxness; 1989; Weed Sci. 37(4):498-502. (Crop & Weed Sci. Dept., N. Dak. State Univ., Fargo, N. Dak. 58105-5051) Reports more unmetabolized picloram reached leafy spurge roots when applied with 2,4-D than alone, thus the added control when applied together.

Common Use: Better for Cattle, Sheep, and Rangelands; by J.E. Bowns; 1989; Utah Sci. 50(2):117-123. (Range Science, Southern Utah State College, Cedar City, Utah 84720) Results of a long-term study on summer range in southwestern Utah to evaluate single and common use grazing.

Comparisons of Grazing Systems in Wyoming; by Richard H. Hart, Marilyn J. Samuel, J.W. Waggoner, Jr., and M.A. Smith; 1989; J. Soil & Water Cons. 44(4):344-347. (USDA, ARS, Cheyenne, Wyo. 82009) Results of a study comparing short-duration grazing with rotationally-deferred and continuous grazing on blue grama-western wheatgrass range near Cheyenne.

Compiled by John F. Vallentine, Professor of Range Science, Brigham Young University, Provo, Utah 84602

Control of Leafy Spurge *(Euphorbia esula)* with Growth Regulator-Herbicide Combinations; by Mark A. Ferrell, Thomas D. Whitson, and Harold P. Alley; 1989; Weed Tech. 3(3):479-484. (Dept. Plant, Soil & Insect Sci., Univ. Wyo., Laramie, Wyo. 82071) Special growth regulators did not enhance the control of leafy spurge by herbicides.

Does Short-Duration Grazing Work in Arid and Semiarid Regions?; by F.C. Bryant, B.E. Dahl, R.D. Pettit, and C.M. Britton; 1989; J. Soil & Water Cons. 44(4):290-296. (Dept. Range & Wildl. Mgt., Texas Tech Univ., Lubbock, Texas 79409) Reviews the benefits and failures of applying short-duration grazing with emphasis on West Texas.

The Effects of Grazing and Browsing Animals on Wildlife Habitats; by P.J. Urness and D.D. Austin; 1989; Utah Sci. 50(2):105-107. (Dept. Range Sci., Utah State Univ., Logan, Utah 84322) A review of manipulative grazing when applied to Utah range situations.

Hand Application of Herbicide Pellets to Control Small Juniper and Pinyon Trees; by N.E. West and N.S. Van Pelt; 1989; Utah Sci. 50(2):62-65. (Dept. Range Sci., Utah State Univ., Logan, Utah 84322) Describes an effective control method using tebuthiuron ("Spike") pellets.

Hierarchical Foraging Models; Effects of Stocking and Landscape Composition on Simulated Resource Use by Cattle; by Richard L. Senft; 1989; Ecol. Modelling 46:283-303. (202 D Central Manor Road, Mountville, Pa. 17554) Develops the mathematical framework of hierarchical foraging theory and uses the resulting model to investigate the effects of stocking rate and resource availability on cattle diets and habitat use.