Spatial Distribution and Grazing Behavior of Livestock in a Rural Village of the Bolivian Highlands

by Zulma R. Victoria, Isaac M. Ortega, and Fred C. Bryant

Bolivian campesinos traditionally herd their livestock away from corrals to graze them in either native rangelands (NR), fallow fields (FF) (rested from cultivation), or alfalfa pastures. We determined the spatial and temporal distribution of livestock (sheep, cattle, donkeys) herds from April 1992 to March 1993 in these grazing areas in the central altiplano of Bolivia. One hundred and thirty-two herds were followed to record the route and time spent in each grazing area. Walking, feeding, resting, and drinking behaviors were recorded while animals were in these grazing areas. Animals were herded mostly to FF (54% of the time), followed by NR (35%) and alfalfa fields (11%). Fallow fields were used more in the wet (60% of the time) than in the dry (50%) season, while NR were used more in the dry (41%) than in the wet (27%) season. Animals were herded an average of 4 mi per day, spending more time in grazing areas in the wet (9 hr/day) than in the dry (8 hr/day) season. The primary activity of animals in grazing areas was feeding which was greater in the wet (67%) than in the dry (62%) season. Cattle spent the least time feeding (59%) compared to sheep (66%) and donkeys (68%). Animals walked more in the dry (27%) than the wet (24%) season.

We are studying spatial distribution and grazing behavior of livestock in Bolivian highlands.

Livestock Diets in the Bolivian Highlands

by Magali Caceres, Isaac M. Ortega, Karen Launchbaugh, and Fred C. Bryant

Agricultural fields traditionally are rested from cultivation, but used as grazing areas by Bolivian campesinos. We determined sheep, cattle, and donkey diets from April 1992 to March 1993 on fallowed crop fields in the highlands (12,500 ft) of the Bolivian altiplano, near La Paz. Fields were classified according to the years since cultivation (i.e., C-1 = first year after cropping; C-2 = 2 years after cropping, etc.). We

We are using the bite-count method to study livestock diets in Bolivia.

determined diet botanical composition of sheep, cattle and donkeys using the bite-count method. Sheep used forbs heavily (84%) in C-1 fields but shifted to grasses (above 35%) and forbs (above 45%) in C-2 to C-5 fields. In C-6 fields sheep diets included browse (22%). In C-1 fields, cattle used more forbs (74%) than grasses (26%). In C-2 and C-3 fields, cattle used less forbs and more grasses (above 54%), but in fallow fields older than 4 years cattle used mostly grasses (above 91%). Donkeys used over 45% forbs in C-1 and C-2 fields. In C-3 fields donkeys shifted to grasses (64%), a forage increasingly used with age of fallow up to C-6 (93%). Some of the forbs important to livestock were *Chenopodium petiolare* and *Tarasa tenella*. Important grasses were *Bouteloua simplex* and *Festuca orthophylla*, while *Parastrephya ephidophylla* was a shrub species highly used by livestock especially in C-6 fields.

Economic Success of Range Reseeding in an Arid Environment

by D. E. Ethridge, R. E. Sosebee, R. E. Sherwood, B. G. Stanaland, and C. H. Herbel

Information from range reseeding experiments from USDA and the Jornada Experimental Range in New Mexico was used to establish relationships for stand establishment for both native and introduced grass species. Major factors determining stand establishment are soil moisture and temperature conditions and seedbed preparation techniques. Costs of seeding were estimated, stand establishment was valued in accordance with its revenue generating potential, and probabilities that conditions needed to achieve different levels of stand establishment were estimated.

The combinations of soil temperatures and soil moisture required to achieve stand establishment do not occur often in arid environments. Seedbed preparation techniques, such as mulch covers and pits performed by low-cost farm machinery, improve the situation to some extent. For introduced grass species, none of the seedbed preparations on which data were available improved stand establishment prospects. For native grass species, both pits and mulch preparations increased the

probability of achieving a good or excellent stand, but also increased the probability of getting a stand failure. These measures of outcome likelihood have a major impact on income potential.

After accounting for revenues over time from reseeding, costs of reseeding, and the probabilities of various stands being obtained, the expected net present values of reseeding of various grasses were estimated using a 3% discount rate. These results indicate that reseeding of rangeland in arid environments is not feasible as a straight financial investment; there was a net loss for every grass species analyzed. If there are overriding reasons to reclaim land by reseeding, the findings provide some indications on which alternatives are more desirable. For native species, mulching as a seedbed preparation is more attractive financially than either pits or no preparation. The best species from a revenue perspective is blue grama, followed by little and 'Old World' bluestem, sideoats grama, and fourwing saltbush; these species incur smaller financial losses. For introduced species, Lehmann lovegrass with no seedbed preparation is a viable alternative, followed by rhodesgrass.

Probabilities of Climatic Conditions for Stand Establishment on the Jornada Experimental Range

	Introduced Species	Native Species		
Stand	No Seedbed preparation	No Seedbed preparation	Pits	Mulch
	----------Probability----------			
Excellent	0.02	0	0.14	0.24
Good	0.1	0.12	0.03	0.15
Fair	0.04	0.06	0.06	0.00
Poor	0.08	0.57	0.22	0.00
Fair	0.76	0.25	0.55	0.61

Expected Net Present Values of Reseeding Various Grasses on Arid Ranges in Texas and New Mexico, 3% discount rate; $/acre.

	Expected Net Present Value		
Species	No Seedbed Preparation	Pits	Mulch
	----------Native Species----------		
Sideoats Grama	-$11.53	-$15.90	-$10.73
Tobosa Grass	- 40.53	- 44.90	- 39.73
Vine Mesquite	- 23.53	- 27.90	- 22.73
Giant Sacaton	- 26.53	- 30.90	- 25.73
Alkali Sacaton	- 20.53	- 24.90	- 19.73
Black Grama	- 40.53	- 44.90	- 39.73
Fourwing Saltbush	- 12.53	- 16.90	- 11.63
Bush Muhly	- 40.53	- 44.90	- 39.73
Blue Grama	- 8.53	- 12.90	- 7.73
Little Bluestem	- 11.53	- 15.90	- 10.73
Old World Bluestem	- 11.53	- 15.90	- 10.73
	----------Introduced Species----------		
Lehmann Lovegrass	- 8.26	—	—
Boer Lovegrass	- 15.51	—	—
Rhodesgrass	- 9.76	—	—

Nutritional Content of Livestock Diets in the Highlands of Bolivia

by Esther C. Lopez, Isaac M. Ortega, Karen Launchbaugh, and Fred C. Bryant

Few livestock diet studies in the highlands of Bolivia have considered nutritional content and its implications. We determined the nutritional content of sheep, cattle, and donkey diets in the peasant community of San Jose Llanga, Department La Paz Bolivia, from August 1992 to August 1993. We constructed simulated diets from bite-count diet observation and analyzed them for crude protein (CP), acid detergent fiber (ADF), and the minerals calcium, potassium, and phosphorus. Fields were classified according to the years since cultivation (i.e., C-1 = first year after cropping; C-2 = 2 years after cropping, etc.). Overall, in the livestock diets crude protein varied from 6.9% (C-5) to 8.3% (C-1 and C-2). Crude protein in cattle diets ranged from 6.3% in C-5 fields to 9.2% in C-2 fields. Donkey diets were the lowest in CP among livestock, especially in fields C-5 (5.6%) and C-6 (5.4%); diets were highest in the C-1 (8.9%). Phosphorus in diets were similar for all livestock at 0.2%. Phosphorus was as high as 0.4% in diets during the wet season. Potassium averaged 1.3% in diets of donkeys and up to 1.5% for sheep and cattle. This mineral was highest (3.5%) in the early wet season (December) and lowest by the end of the season (0.3%) (October). Calcium averaged 0.7% in cattle and donkey diets and was 0.9% in sheep diets.

The nutritional content of livestock diets is being studied in Bolivia.

Defoliation Effects on Resource Allocation in Arizona Cottontop and Lehmann Lovegrass

by Jerry R. Cox and Mateo Giner-Mendoza

Aboveground and belowground productivity, nitrogen and phosphorus allocation, and photosynthetic potential of Arizona cottontop, a bunchgrass native to the Chihuahuan and Sonoran Deserts in North America, and Lehmann lovegrass, a bunchgrass introduced to the southwestern United States from southern Africa, were measured following defoliation. Arizona cottontop re-established a canopy more quickly than Lehmann lovegrass after defoliation. Differences were due to