

future success. Experimental treatment based on a growing understanding of the target species and its environment allows us to accumulate knowledge. This stepwise approach can be more effective, more economical and lead us more surely to an understanding of arid and semi-arid tropical shrublands and their potential contribution to the welfare of their inhabitants.

Our work in Brazil demonstrates this approach to integrated brush management. Other scientists have surveyed production systems and producer needs, described range sites, determined sheep and goat diets on cleared and uncleared caatinga, and estimated plant productivity. I am determining the sprouting potential of woody plants under

different cutting and browsing regimes. All of these are separate studies that will add to the scientific literature. But the real payoff will come when we can put all the studies together to meet the needs of land managers for integrated brush management programs.

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# Performance of Icelandic Horses in Northwestern Alaska

William B. Collins and John Brooks III

Horses played a significant role in exploration and settlement of Alaska during gold rush days. However, with the increase of mechanized transportation, horses became less important and generally too expensive to keep for purposes other than recreation. Some would argue that horses are also too expensive to keep for recreational purposes. In 1982 a different breed of horse—one which appears well adapted to living off the range in summer and winter with little supplementation—was introduced to the state. The following is a brief description of that breed, its history, its requirements, potential uses, and special adaptations which make it more satisfactory than its predecessors as a work or pleasure horse in northwestern Alaska.

## The Breed

About 1000 years ago, settlers from Scandinavian countries and the British Isles began arriving on the volcanic island of Iceland. These Viking farmers had crossed the North Atlantic in open boats, bringing with them all they thought essential for pioneering in their new, often harsh, environment. Perhaps the most enduring of their precious cargo was horses. Their horse was relatively small (13-15 hands and 850-900 lb), typical of European horses at that time. During the next 1000 years, "Icelandic" horses were to

remain isolated from other horse populations. This was made possible as the Althing (the oldest parliament in the world) passed a law in 930 forbidding the importation of horses to maintain breed purity. Some scholars have suggested that the establishment and long existence of the Althing depended on horses to enable Icelandic chieftains to gather together from across the rugged country. From the time of settlement until the beginning of the 20th century, Icelandic horses represented the sole means of transportation for people and goods. Had there been a network of roads and bridges, perhaps a larger horse would have been bred to pull wagons and carriages. As it was, Icelandic horses were well suited to cross-country travel and could be kept year-round on open range.

People outside Iceland have become increasingly aware of the self-sufficiency, stamina, fecundity and longevity of the Icelandic horse. This animal has become well known for being the only remaining European breed to retain five distinct gaits, the most notable of which is the Tolt, or running walk (The Tolt disappeared from Europe as larger horses were bred for the purpose of carrying mail-clad soldiers and pulling wagons and carriages.) The horse is ideal for the Icelandic sport of "trekking," in which the horse is ridden cross-country 20-40 miles/day over several consecutive days, resting and grazing at night. The breed has a variety of colors as it was bred only in accordance with strict standards on quality of gaits. In addition, extremely severe winters

*Authors' Note:* As of March, 1984, there were only eight Iceland ponies in Alaska. Prospects for more are good for use as pack animals, sport hunting, fishing, and pleasure riding.

which occurred at intervals during the period 1200 to 1800 AD placed positive selection pressure on weather-resistant individuals having relatively low requirements for supplemental feed and an exceptional ability to forage through wind-packed snow and ice. With the exception of the Yakutian horse found in Siberia, no other breed is known to exhibit such special adaptation to severe winter environments.



*Bluejoint range in mid summer. (They eat cottongrass and willows in winter).*

In 1929, several decades before the riding qualities of the Icelandic horse made it popular to recreational riders outside Iceland, A.E. Porsild promoted use of the horse for reindeer herding in North America. He said:

The Iceland pony, particularly, would be well suited to this country, as it would need no more care or protection than the reindeer and would do well on practically the same feed. All cross-country travel during the summer has, at present, to be done on foot with pack-dogs, which means that tent, blankets, etc., must be dispensed with, also that on account of scarcity of game, dog feed must be carried. To a future reindeer industry, ponies should prove a factor of great importance and would make herding much easier and more attractive.

However, more than 50 years would pass before Icelandic horses would be tried for reindeer herding in North America.

In June, 1982, NANA (a regional native corporation headquartered in the coastal town of Kotzebue, Alaska, 30 miles north of the Arctic Circle) purchased 7 geldings and 1 mare for purposes of herding reindeer and transporting camp supplies during the summer when snowmachines are not functional. NANA chose Icelandic horses over other breeds because they learned from prior experience that larger breeds were too expensive to maintain during the annual 6 or 7 months the horses were idle. Indeed, with the exception of freight companies in the early part of this century, most who have tried to justify keeping horses on a cost-benefit basis have found it is much too expensive to maintain them through the winter. In Klondike days horses were generally used for a season, slaughtered, and new ones brought in the next year. With the larger breeds NANA originally used, it appeared it might have been less expensive to fly the horses south for the winter rather than try to winter them in the Kotzebue area.

## Performance

Icelandic horses demonstrated several advantages for reindeer herders. Herders were better able to keep abreast of the herd when on horseback than on foot (anyone who has ever tried walking any distance over tussock tundra can readily appreciate this fact). Unlike snowmachines and 3-wheelers (all-terrain vehicles), the horse can also swim rivers and streams. From atop the horse, the herder commands a



*Baldwin Peninsula in late summer. Horses feeding on a robust sedge, Carex saxatilis.*

much better view of the herd movements, an advantage which should prove especially valuable as the practice of herding with dogs is reestablished among Alaska reindeer herders. Herders on horseback are also able to more readily approach and calm reindeer. Horses provided a ready means of transporting camp across country. Finally, Icelandic horses demonstrated ability to forage productively on most tundra sites, a topic addressed in the following section.

NANA's 8 horses exhibited amazing resiliency in their response to stress and work into which they were thrust immediately following their purchase: they were trucked for 3 days from British Columbia to Alaska; rested for a week; flown to Kotzebue; rested 4 days (actually, gave rides to many of the children in Kotzebue during this "rest"); ridden for 5 days to Church Rock (a distance of nearly 110 miles), crossing much rough country and many streams and rivers swollen with spring runoff; rested 2 days; and ridden across country to Calahan (70 miles in 2 days), then to Arctic Circle for roundup of a butcher herd. After the horses left Kotzebue, they foraged on native vegetation, receiving little grain supplementation. Later, the horses were used almost daily, 12 h/day, a practice not recommended and later discontinued. During this time, the horses received up to 7.5 lbs. of barley per day, but declined in condition until the work load was reduced. Much of the summer reindeer herding took place in areas of knee-high tussocks, interspaces of which are spongy, wet ground. In contrast to the larger breeds previously used, Icelandic horses negotiated this type of terrain extremely well. This is particularly noteworthy in that most herders had never ridden a horse prior to June, 1982. The horses tolerated the variety of riders very well. They were

also very tolerant of clouds of mosquitoes which attacked face and belly. Insect repellent reduced mosquito and fly attacks, but even when without its protection, the horses did not appear overly distressed. The horses remained in relatively good condition under the described conditions, except when worked hard on a daily basis. A few additional horses should have been used in the NANA Operation so that



Packing camp to keep abreast of widely ranging reindeer.

worked stock could be rotated with rested ones at least every 3 days. During the peak of the work season, the horses simply expended more energy than they could safely consume, and received inadequate rest.

### Nutrition and Care

Preliminary observations suggest that the Icelandic horse will consume a wide variety of plant species found on ranges in northwestern Alaska. It utilizes a much wider array of plants than other breeds and continues to forage under severe climatic conditions. Principal species in the summer diet were dunegrass (*Elymus arenarius*), and carex (*Carex* spp.). After the first snow in October, diets shifted more to tufted hairgrass (*Deschampsia caespitosa*) and fescue (*Festuca* spp.). Then, beginning in mid-November, the horses consumed primarily diamond willow (*Salix pulcra*) and bluejoint (*Calamagrostis canadensis*) growing beneath the willow. From mid-December until mid-March, the diet consisted almost entirely of tussock cottongrass (*Eriophorum vaginatum*), the predominant grass-like plant on the Baldwin Peninsula where the horses were kept for the remainder of the winter. It should be emphasized that the dietary preferences reported here were greatly influenced by relative availability of forage species (i.e., the horses wintered in a range type having vegetation composition very different from those range types where summer and fall feeding preferences were observed).

Researchers report maintenance energy requirements for the Icelandic horse which are at least 20% lower than recommendations for other breeds. Initially, we were skeptical of this. However, observation that NANA's horses remained in relatively good condition while idle and totally dependent on winter range causes us to conclude that energy supplementation is not necessary for Icelandic horses over-wintering on this kind of tundra range. We did determine, however, that digestible protein availability was considerably less than adequate for maintenance. Thus, we recommend protein

supplementation in winter unless the horses are kept on range types having greater protein availability.

Dietary levels of zinc (in summer) and copper (in summer and winter) were also low, but these are easily and inexpensively supplemented by use of mineralized salt. Regular mineral supplementation can also help prevent digestive upset which might be caused by sudden changes in diet as would occur under emergency feeding or abrupt changes of range. We did not determine dietary levels of vitamins, since deficiencies on tundra ranges are unlikely. Horses generally obtain sufficient vitamin D from range vegetation and/or exposure to sunlight. Thiamine is found in most forages in adequate amounts, in addition to being synthesized in the digestive tract and absorbed in the cecum. Vitamin B<sub>12</sub> is also synthesized and absorbed in the large intestine, and supplementation is deemed unnecessary in mature horses. We are certain the horses consumed adequate vitamin A because they ate significant amounts of living, green plant tissue year-round. The cambium of willow, leaves of mountain cranberry (an evergreen shrub) and winter production of cottongrass provided vitamin A in winter. Additionally, a 5-6 month supply of this vitamin is stored in the liver following good summer grazing.

We were impressed that these horses continued to forage through wind-packed and iced snow more than 20 inches deep. Only when ice layers form right at the plant/ground surface are the horses unable to break through, making it necessary to supplement with hay at approximately 9 lbs/day. It is also noteworthy that NANA's horses appeared tolerant of winter winds which averaged 10 to 20 miles/h at temperatures of 0° to -30°F in an area which afforded little protection from the wind. These observations support recommendation that Icelandic horses be wintered on the range and only supplemented as needed. Supplementation for mares becomes mandatory in the last 2 months of gestation and in the first 2 months of lactation. In Iceland a common means of supplementing energy, protein and minerals is to set out barrels of salted herring which are consumed by the horses on an ad lib basis at approximately 1 fish per day. Not only do Icelanders believe it is nutritionally practical to winter their horses on the range, but they believe it is advisable from the standpoint of enabling the horses to develop and maintain strong tendons and joints.

Energy demands of any animal are greatly increased by work, the Icelandic horse being no exception. Where only 8 Mcal metabolizable energy per day is recommended for maintenance of a 840 lb horse, almost 10 Mcal/day is recommended for "easy movement" and nearly 12 Mcal/day for a horse which is ridden 2-3 hours daily. Thus, it is easy to understand why NANA's horses declined in condition when worked 12 hours per day, even when receiving 7.5 lbs. supplemental barley per day. It should be recognized that no amount of supplementation can allow a horse to be over-worked; one may get away with such abuse in the short term, but will greatly reduce the years of satisfactory service. Hopefully, anyone considering the use of Icelandic horses will not be so impressed by the horse's strength and hardiness so as to abuse it. The fact is, that if properly treated, the Icelandic horse has the potential to work for up to 25-30 years, and a life expectancy of 35-40 years. At least one



Icelandic horse has been reported to be alive and well at 53 years. Both mares and stallions remain reproductively fit until approximately 25 years.

### Conclusions

Gunnar Bjarnason, Iceland's expert on horses, has said, "There are many incredible things about our unique horse which are difficult to understand and accept in the beginning" (pers. comm.). Perhaps the most surprising characteristics of this horse are its ability to utilize tundra vegetation as its principal source of food year-round and to remain fit in the arctic environment with minimal energy and protein supplementation. It is a willing servant in terrain and conditions where most other breeds are reluctant to go or unable to perform. These characteristics, alone, command the attention of individuals considering the acquisition of horses for use in tundra regions. Add to the above that the Icelandic horse can provide far more years of service than other

breeds, and it becomes apparent that their purchase may be economically justified for many purposes.

In the long history of the breed, the Icelandic horse has unquestionably demonstrated its usefulness as a riding, herding, pack and draft animal. In the past two years, it has demonstrated its value in Alaska's reindeer industry. We can think of many other potential uses for this horse. It would appear to have prospects as a pack animal in sport hunting and fishing, and it is conceivable that sports like trekking or dude riding could become significant attractions to recreationists and tourists in some of our communities. We cannot imagine a more enjoyable way for one to get out and experience the beautiful lands of the north.

(NOTE: This article is based on one published by the Agricultural Experiment Station of the University of Alaska, Fairbanks; *Agroborealis* 16:27-32.)

# The Range Manager's Contribution to Small, Mixed-farming Systems: Portugal as a Case Study

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*Editor's Note:* A proof that good range management can occur anywhere in the world on any sizes of unit.

Portugal does not have what is generally considered rangeland, but livestock are produced there under conditions that challenge our profession to new perspectives on range management. Portugal's ancient landscape has been intensively cultivated and grazed for centuries. While the country has grown into a busy, modern nation, its livestock production systems share aspects common to many lesser developed regions. Agricultural production has a restricted land base which must meet dozens of conflicting, interchangeable demands. This precludes the extensive livestock production systems to which most range managers are accustomed and requires that we adapt our understanding of rangelands to small, intensive, mixed-production systems, where grazing animals may be a luxury. Livestock must co-exist within the framework of a closely integrated and flexible agricultural production system.

Portugal has a Mediterranean climate. Rainfall occurs primarily in winter and ranges from 2,800 mm (112 inches) in the northeast to 400 mm (16 inches) in the south. Temperatures are mild (average annual temperature 15 degrees C.), rarely below freezing except at high elevations. The growing season is balanced between the rainy but too cool winter and the warm but too dry summer.

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Topography varies from flat, shifting lowlands bordering the Atlantic coast to steep, boulder-strewn mountains in the Northeast. The Tagus River bisects the country north-south and roughly defines the undulating plains of the Alentejo in the South.

Livestock production systems follow these topographic divisions.

### The Littoral

The coastal areas north and south of Lisbon are densely populated but still support extensive pine and eucalyptus plantings, descendants of the pine forests planted by Dom Dinis in the 13th century to stabilize sandy soils and protect inland areas from the sea. This is also Portugal's most industrialized region, and many farm families are partially supported by the men's factory jobs. Land holdings average less than 2 ha (5 acres) and are often composed of up to twenty far-flung parcels, as land is divided at death and reshuffled by marriages. Many of these parcels are too small to farm with machinery, though tractors have replaced draft animals whenever possible.

The cattle in this region are mostly Friesians and they produce over half the nation's milk supply. Most villages have cooperative milking parlors, and evening driving presents a frightening obstacle course of women leading their cows to milk as the men return home on bicycles or motorcycles.

The average farm has only one or two cows. Cows are kept adjacent to the home and fed green chop, silage, hay, and by-products like turnip tops. Grain feeding is mostly limited