

Frontal Grazing: Forage Harvesting of the Future?

Jerry D. Volesky

Frontal grazing is a new method of grazing management. The frontal grazing system features a livestock-driven, sliding fence apparatus which allocates and controls grazing within a pasture. Livestock advance moveable fence to gain access to ungrazed forage by pushing on a cable with their foreheads. Forage loss due to trampling and defecation is minimized as the livestock, at a high stocking density, uniformly graze and advance the fence across a pasture. The equipment is a technological package that strives to make efficient use of the forage resource and human management or labor, maximize nutrient cycling, and make practical use of animal behavior.

Development

The frontal grazing system was invented and developed by Fernando Pereda, an Argentine livestock producer and a graduate of Rensselaer Polytechnic Institute in New York¹. The idea for the system arose in a dream about 20 years ago. This dream, however, was fueled by the marriage of a common occurrence on a ranch and a labor problem. The common occurrence was the observation of cattle placing their heads through and under fences in order to graze on the other side. The labor problem that Pereda faced was the movement of a temporary fence that was a barrier for a large flock of sheep that were strip-grazing a pasture. Each day the fence had to be moved to give the sheep access to about two more acres of ungrazed forage. The dream unified the common occurrence and labor problem and resulted in a vision of cattle pushing a fence whenever they needed more forage.

Frontal grazing relies heavily upon animal behavior and their inherent

tendencies. The system has a strong basis with some animal behavior research by B.F. Skinner, a Harvard University psychologist. Skinner has demonstrated that animals will essentially manipulate their surroundings to get what they want.

Frontal Grazing System Components

The main components of the frontal grazing system include: 1) an electric wire and an insulated push-cable; 2) a centrally located pace-governor; 3) sleds which support the electric wire and push-cable; 4) two parallel, high-tensile lateral wires; and 5) a set of pulleys which travel along each lateral line and form the union with the frontal fence wire and push-cable. Peripheral equipment includes a water alley outlet post and a moveable backfence. Pasture arrangement of the fencing and equipment is shown in Figure 1.

The electric wire and push-cable of the frontal fence are about 28 and 8 inches above the ground, respectively. The supporting sleds are spaced at about 40- to 50-foot intervals across

¹J.D. Volesky is a research scientist with the USDA-ARS, Forage and Livestock Research Laboratory, P.O. Box 1199, El Reno, Oklahoma 73036.

¹The main components and equipment for frontal grazing are patented and manufactured by Fernando R. Pereda, Hipolito Yrigoyen 1534 Piso 3 "G" 1089 Buenos Aires, Argentina.

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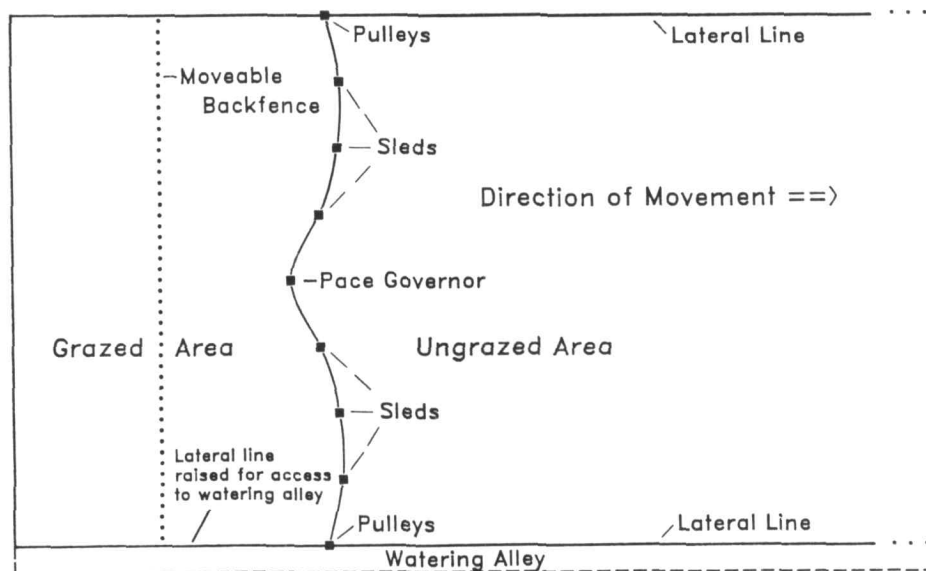


Fig. 1. Pasture arrangement of the frontal grazing system and peripheral fences.

the front and form an arc from each lateral line to the pace-governor (Fig. 1). The pace-governor, which acts as a tension regulator, is located in the center of the frontal fence and provides some resistance with regards to animal advancement of the fence (Fig. 2). The electric wires on each side attach to a spring-loaded scissor mechanism located on the upper front part of the pace-governor. When wire tension becomes high, the scissor mechanism opens, allowing a cogged wheel to roll forward about 8 to 20 inches. When wire tension is relieved, the scissor mechanism will close, stopping movement of the cogged wheel. The lower push-cables are simply attached to spools located at the rear of the pace-governor. Wires and cables can be rolled up on these spools when storing or moving the equipment to a new location.

Lateral lines, which guide the frontal fences are made of a single strand of at least 12.5 gauge high-tensile wire placed 28 inches above the ground. H-braces are used at each end of the lines. Wooden posts and guides which secure the lateral line wires are spaced at 100-foot intervals. The guides, through which the wires pass, are T-shaped and are bolted into the top of each wooden post in the lateral line. This allows the pulleys, which form the frontal fence and lateral line union, to track along the wire and pass each post (Fig. 3).

A backfence, which is moved by hand, is typically placed about 150 to 200 feet behind the frontal fence to prevent livestock from regrazing or trampling forage. Livestock water is located in an alley (15-30 feet wide) running parallel to one of the lateral lines (Fig. 1). Access to that alley is provided by an 8-foot pole which hooks onto and raises the lateral line. A length of wire with one end connected to the electrified lateral line is wrapped around the pole to prevent livestock from rubbing against it. Because this watering alley access pole is periodically moved as the frontal fence progresses across the pasture, a bell or plastic bottle is attached to it so that the livestock may

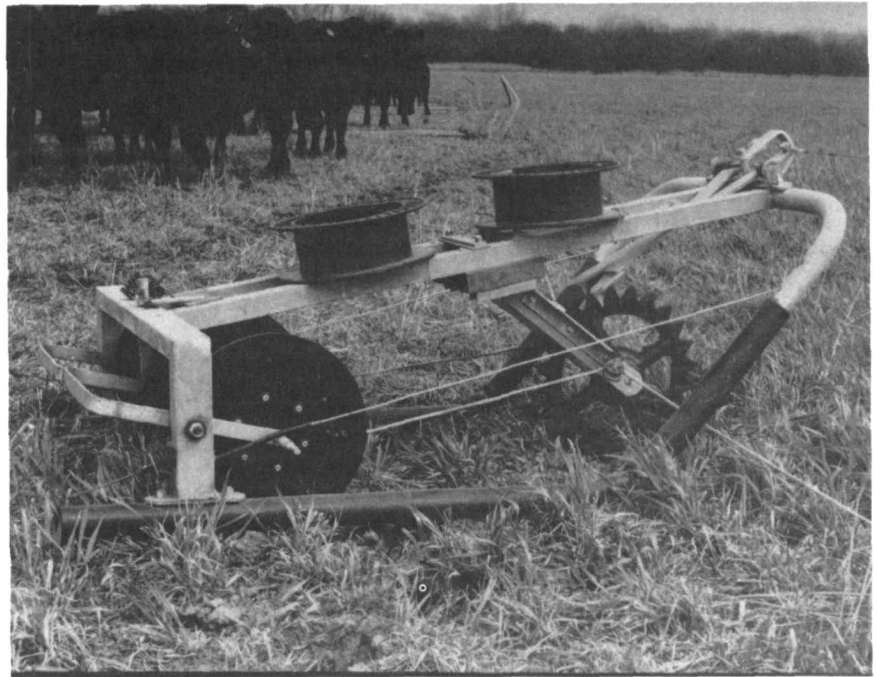


Fig. 2. The pace-governor (tension regulator) which is located at the center of the frontal fence.



Fig. 3. Pulley apparatus which forms the union of the frontal fence and lateral line. Also shown is a lateral line post and wire guide.



Fig. 4. Cattle actively grazing at the frontal fence.

more easily form an association with its location.

All wires of the frontal grazing system (excluding the push-cable) and the pace governor are electrified. The sleds are not electrified and have an insulated bracket which supports the upper 'hot' wire. As with all electric fences, charged wires of the frontal grazing system provide a psychological barrier and the push-cable provides a physical barrier.

There are about five frontal grazing systems currently in use in Argentina. Most have a width (distance between the 2 lateral lines) of 650 or 1,000 feet. The length can be as long as the available pasture and typically are from 2,500 to 4,000 feet. If the available pasture is of a shorter length, three lateral line fences could be constructed to create two frontally grazed fields. This would allow a grazing pass down one field and a return pass in the opposite direction on the second field.

System Operation and Management

Cattle used in the frontal grazing system should be electric fence trained prior to starting. It is also important that they be initially placed in the watering alley to allow them to learn the water tank and watering alley pole locations. This helps them overcome any fears of walking under the raised lateral line to and from the watering alley and grazing area.

A frontal grazing system begins with the frontal fence placed about 160 feet from one end of the pasture. A 328-foot (100-meter) wide system requires a minimum of 90 to 100 head of cattle (1 head/3.6 to 3.3 feet of frontal fence) for effective operation. Fewer cattle, may result in over-concentration on one side of the pace-governor and advancement of only half of the frontal fence. This causes wire tension and equipment problems. Frontal stocking as high as 1 head/2.5 feet of frontal fence has been used. Stocking density in a 328-foot wide system, for example, with 100 head and the initial allocation of 160 feet, is 83 head/acre. When all cattle are at the front fence during a grazing bout, they are essentially lined up should to shoulder (Fig. 4).

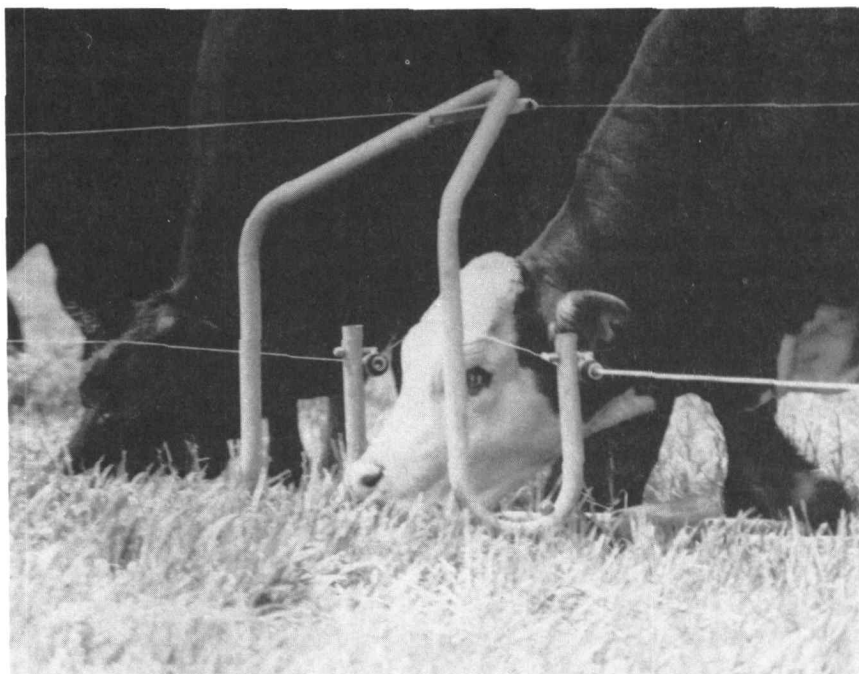


Fig. 5. Steer beginning a pushing effort while grazing at one of the sleds.

The initial allocation of 160 feet (depending on forage quantity) will last about 1 to 1.5 days. With the rapid depletion of forage, the cattle become interested in the frontal fence but the actual learning process requires human assistance. Sleds are manually pulled ahead about 1 or 2 feet to expose a strip of ungrazed forage which is readily consumed. This is repeated several times a day. After 3 to 4 days, the cattle are on their own and will readily push and move the frontal fence forward as they need. This learning process can be made less labor intensive by retaining several cattle with previous frontal grazing experience and mixing them in with a group of new cattle. If the cattle are familiar with a supplemental feed, placing a few small piles or a line of this feed in front of several of the sleds will encourage them to push it forward.

The key components for advancement of the frontal fence are the sleds. An animal using its forehead can lift and push on the push-cable and advance the sled forward (Fig. 5). Depending on the amount of force applied, advancement from such an effort may range from 0.5 to 1.5 feet. The frontal fence will also advance to a much lesser degree when enough

force is applied to the push-cable at any point across the front. An important interaction occurs between ease and distance of advancement and frontal fence and lateral line tension. If tension is high, force applied to the push-cable is transferred to the pulley apparatus which in turn causes it to roll forward in order to relieve the tension and degree of curvature or arc of the frontal fence.

A hierarchy will typically form within the herd with several dominant animals preferring to graze at, and do the pushing of the sleds. These 'pushers' are commonly those animals which had the least fear of the frontal fence and were the first to push it during the learning period.

Forage utilization is directly reflected in the daily rate of advancement of the frontal fence. Rate of advancement is primarily related to quantity of available forage, frontal stocking, and forage intake of those cattle. Other important variables which affect rate of advancement include forage type and forage maturity or palatability. Management can influence rate of advancement, and thus forage utilization, by a combination of two adjustments. If there is a need to slow rate of advancement and increase utilization, the position of the electric

wire at each of the sleds can be adjusted outward so that it is closer to an animal's neck and shoulders (Fig. 5). Secondly, an increase in electric wire voltage from the typical 2,500 to 5,000 volts or greater may also be beneficial. These two measures increase the probability of an aggressive animal receiving a strong shock. There will be a 1 or 2 day lag time for these adjustments to take effect because the majority of the pushers or dominant animals within the herd will have to receive one or more shocks.

Livestock management is generally easier with frontal grazing. Herd sizes are relatively large, but the animals are more docile than those used in other types of grazing systems.

Frontal Grazing System Applications

As with all intensive grazing systems, management needs and inputs for frontal grazing are quite high. This is particularly true during the first several days of operation when the cattle are learning and adapting to the system. Subsequently, there should be thorough daily checks of the equipment and as needed, movement of the backfence and watering alley outlet pole. Periodic checks should also be made of the lateral line tension and wire voltage.

Frontal grazing has some similarities with regards to the basic principles and objectives of short-duration or rotation grazing systems that have a one-day occupation period in a subunit (paddock). Even more of an association can be drawn with grazing management that features a daily allocation or rationing of a strip of forage to livestock.

The basic requirement for the use of a frontal grazing system is a relatively flat and productive pasture which is free of trees and shrubs. Topography should not include abrupt drainageways or other obstacles which could impede the pace-governor, sleds, or the frontal fence itself. In Argentina, frontal grazing has been used on several introduced perennial grass pastures as well as some of the sorghum crops and alfalfa. The pastures themselves receive a fairly high level of management including

fertilization, burning, and haying as necessary. Frontal grazing is probably not suitable for most native rangelands (especially semi-arid and arid) because of the intensity of defoliation and lower forage productivity.

Levels of animal nutrition under a frontal grazing system might also be manipulated through the arrangement and types of forage crops used. Strips of alfalfa or some other legume could be established at planned locations parallel to where the frontal fence would pass. Another approach might include the use of a cool-season and warm-season forage combination. If managed as independent pastures, the period for optimum use of a frontal grazing system could be extended. The two types could also be managed within the same pasture with an area of cool-season forage first followed by the warm-season. This might be useful with long frontally grazed pastures where there is a problem of either of the two forage types becoming excessively mature by the time the frontal fence advances to the far side.

Research on Frontal Grazing

Two 328-foot (100-meter) wide frontal grazing systems are being tested at the USDA-ARS Forage and Livestock Research Laboratory near El Reno, Oklahoma. They are being used during the summer on 'Caucasian' Old World bluestem and during the spring on no-till winter wheat pastures. Lengths are 2,500 and 1,500 ft. for the bluestem and wheat pastures, respectively. Animal performance and production, forage intake and composition, and forage disappearance before and after passage of the frontal fence are being measured. The frontal system is being compared against a conventional grazing approach for wheat pasture. Current plans for expansion of the wheat pasture study include the seeding of an additional forage crop to be frontally grazed after the wheat pasture is finished. On the bluestem pasture, frontal grazing is being compared against season-long (June-September) grazing at four different stocking rates.

Forage disappearance after passage of the frontal fence typically

ranged from 65 to 75% on wheat pasture and 50 to 65% on bluestem pasture. Disappearance on the bluestem pasture tended to be on the low end of that range when forage began to mature. Two passes or runs of the frontal fence were made on the bluestem pasture with lengths of 30 and 20 days, respectively. Cattle were held on an adjacent pasture for 14 days after the first pass to allow more forage regrowth. This gave a nonuse period of 44 days for the starting area, but this decreased progressively down the pasture as the second run had a greater rate of daily advancement.

The few observations and data given reflect some of the different management approaches and decisions that have to be made as well as questions that need to be answered. Of major importance is the length of the frontally grazed pasture, which must be long enough to allow an adequate nonuse and regrowth period. With some forages, persistence may need to be considered. Reflected in length of nonuse period is quantity of regrowth for the second or possibly a third or fourth pass. One must keep in mind that forage quantity is the major factor influencing daily rate of front advancement. There are likely to be other interactions to varying degrees with forage type, growth pattern, starting date, and growing conditions.

Under frontal grazing, grazing efficiency is hypothesized to be higher due to very uniform utilization and less trampling of ungrazed forage. Because of the high stocking density under frontal grazing, manure is evenly distributed and trampled on the grazed area as the front fence progresses forward. This lends itself to some potentially interesting studies with regards to nutrient cycling, soil compaction, and intestinal parasite infestation. Parasite infestations may be lessened due to frontal grazing's similarity with rotational systems that provide pastures with nonuse periods long enough to break the life cycles of parasites. Animal travel may also be less, but this is highly dependent on the number and loca-

tions of the tanks in the watering alley. Forage intake may also be increased because of the competitive feeding nature of cattle; as observed in those fed in confinement.

The mechanical components needed for frontal grazing are quite advanced in terms of designs, function, and

operation as a system. As with many inventions, however, minor details are undergoing continued refinement. A major aspect of frontal grazing that needs refinement and development is the management of it as a system, and how the system would fit into a livestock producing operation. As-

sociated with this is a need to evaluate different forages and how they might interact with a frontal grazing system. Perhaps most importantly, frontal grazing will be a very useful tool for research in terms of studying numerous aspects of grazing, animal behavior, and plant responses.

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The official languages of the IVth IRC will be French and English; permanent simultaneous translation will be available, including during field trips.

The Scientific Committee wishes to emphasize issues related to the mediterranean and subtropical isoclimatic zones, but other subjects will be addressed. In particular, general issues of methodologies and management techniques and problems pertaining to other ecoclimatic zones are envisaged.

Registration fees are 2500 FF (approx. 400 US\$) before Oct. 31, 1990 for full members and 1500 FF (approx. 250 US\$) for associate members.

Deadlines for contributions are as follows:

* Title and 50-100 words synopsis : March 31, 1990

* 300-word summary and

* Full paper (4 pages of *Journal of Range Management*, i.e. approx 4000 words): July 31, 1990

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Dr. H.N. Le Houérou, Chairman
IVth INTERNATIONAL RANGELAND CONGRESS
C.N.E.A.R.C.
PO Box 5098
F-34033 MONTPELLIER Cedex
France
Telex: 490 549 F; Fax: (33) 67 41 02 32
