

# A Symposium on Rotation Grazing in North America

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ROTATION grazing composed one of the panel periods at the third annual meeting of the Range Society held in San Antonio, Texas, in January, 1950. Several papers on the subject were read and lively discussions followed.

It soon became apparent that much diversity of opinion exists among both research workers and operators regarding the merits of rotation grazing. Some of these differences seem to stem back to confusion in terminology, as between rotation and deferred grazing; others to the more broadly accepted objectives of these grazing systems, still others to a combination of the two.

The importance of this subject prompted Editor Dr. R. S. Campbell to request the authors to prepare their papers for publication in the Journal, preferably in a single issue. He also proposed that the writer edit the series, prepare a brief review on the subject of rotation grazing, list the most pertinent references, and perhaps draw some conclusions on the merits and application of rotation grazing. All agreed to carry out these proposals.

## HIGHLIGHTS ON ROTATION GRAZING

### *Rotation Grazing Defined*

Rotation grazing consists in shifting the livestock systematically at desirable intervals to different subunits of a range area or fenced subdivisions, and back to the first subdivision, *without specific provision for seed production*.

The objectives are essentially: 1) to avoid grazing the same subunit first in

the spring of each year; 2) to maintain the plant cover over the entire range area in a high state of vigor with little or no decrease in animal production.

Strictly speaking, any prescribed delayed date for placing the animals on a range subunit may be regarded as deferred grazing; to avoid confusion the term as commonly used in this country, is restricted to imply *deferment of cropping until after seed maturity*. The acreage reserved must be large enough to carry all the animals from the ripening of the seed crop of the primary forage species to the end of the normal grazing season.

"Deferred-rotation" is a somewhat common combination term and seems to have a useful place in American range practices. The term is justified for any rotation system which envisages delaying grazing on some small portion of the range until after seed maturity for purposes of revegetation.

Where a range area or fenced pasture is merely divided into *two* subdivisions to improve the vigor of the vegetation or "condition" of the range, the system is properly referred to as alternate grazing. As a rule ranges which have been revegetated through deferred grazing are maintained in good condition by rotation or alternate grazing under proper stocking. Most rotation grazing systems as practiced on the western range are, in effect, deferred-rotation systems in which the primary forage plants have good conditions for setting seed and of getting the seed crop trampled into the mineral soil on one subunit each season. On cattle

range rotation grazing<sup>\*</sup> is carried out by appropriately dividing the area into subunits by fencing or taking advantage of natural boundaries; on open sheep range by herding so as to rotate the grazing at appropriate intervals from one subunit to another.

### *Resumé of Literature*

Numerous studies have been undertaken throughout the world to learn the relative merits of continuous and of rotation or alternate grazing, with or without a planned deferment. These tests have been conducted on native as well as tame pastures, with either cattle or sheep, and under various degrees of stocking. Several plant physiological experiments have also been made to corroborate the results of the rotation grazing trials. The present review is limited to the native range lands of North America, but the bibliography on the subject is more inclusive. In general, the foreign workers have been primarily concerned with intensive management on tame pastures grazed by dairy stock or sheep. Some of these trials gave results favoring a rotation grazing system; in others continuous grazing proved the more practical. Much of the work in the United States has been with dairy cattle, but a limited number of studies have been conducted with beef cattle or sheep on native ranges.

As early as 1895, Smith (40) advocated improvement of natural ranges by dividing them into separate pastures to be grazed in rotation, thereby providing for the spread of forage plants by means of ripened seed. In 1913, Sampson (35) reported preliminary results of a system of deferred and rotation grazing based on the growth requirements of vegetation that would naturally reseed overgrazed portions of sheep range. This proposal was derived from a study in the Wallowa

mountains of Oregon initiated in 1909 and described more fully by this worker (36) in 1914. Jardine (21, 22) in 1915 and 1919 discussed this proposed plan and recommended a system of deferred and rotation grazing where feasible.

About 1915 a study was initiated at Manhattan, Kansas to compare continuous and deferred grazing on native blue-stem pastures. The primary objective was to increase the carrying capacity of the pastures. Anderson (3) reported on this study in 1940. The original deferment to September 1 did not give the desired results. But a deferment to July 1 improved the vegetation, gave greater livestock gains, and increased the carrying capacity over that of the continuously grazed pastures.

In 1919 a study of rotation grazing was begun at Mandan, North Dakota. It compared a three field seasonal rotation system with continuous grazing. In 1941 Sarvis (38) reported that the vegetation in the rotation pastures improved over that in the continuously grazed pasture, but that the cattle made greater gains on the properly stocked (7 acres/head) continuously grazed pasture. Clarke and associates (9) reported in 1943 essentially the same results from a 5 year study at Manyberries, Alberta, except that the weaning weights of the calves were greater in the continuously grazed pasture, and the cow weights were essentially the same for both the rotationally and continuously grazed pastures. Both Sarvis and Clarke suggested that the beneficial effects of deferred and rotational grazing appear to be most evident in the restoration of overgrazed pastures rather than in the utilization of ranges in a highly productive condition.

In the early 20's a study was set up at Ardmore, South Dakota, comparing a midseason alternational system with con-

tinuous grazing. As the rates of stocking were not consistent throughout the study, the results were somewhat confounded. In 1937 Black and associates (7) reported that during the last 3 years of the study when the pastures were stocked at about the same moderate rate, greater gains were made on the alternately grazed pastures. These workers recognized that when pastures of different grazing intensities are compared livestock gains alone are not the only measure of forage production or the success of the system. In 1942, a four year study, also at Ardmore, was reported by Black and Clarke (8), in which the alternate pastures were grazed for a 28 day period (28 days on—28 days off). Under moderate stocking the vegetation in the continuously and alternately grazed pastures appeared to be essentially the same, and there was no significant difference in the weights of the cattle.

Another study initiated in the early 20's near Fort Collins, Colorado, was reported by Hanson and associates (16) in 1931. The deferred-rotation system consisted of 3 pastures, two of which were opened to grazing May 1 and the third was deferred until August 15. This system was compared with continuous year long grazing. At the close of the study the vegetation on the deferred pastures was much superior to that on the continuously grazed pasture. Trampling effect was pronounced on the continuously grazed unit.

Frandsen (12) of the Soil Conservation Service has made a practical study of the application of various grazing systems as used in the Pacific Northwest. He points out the difficulty of obtaining uniform forage utilization under continuous season-long grazing without seriously injuring the more accessible areas of the range. The easy way to improve the forage

cover, he points out, is by a properly applied system of deferred-rotation grazing, the hard way by a properly applied moderate continuous grazing system.

Several clipping studies have indicated what effect the time of use has on productivity of various range grasses. McCarty (27), working with mountain brome, concluded that some form of deferred and rotation system should be employed to insure sufficient carbohydrate storage in the perennial range grasses. In a later study McCarty and Price (28) found that the quantity of carbohydrate reserves in the plants at the end of the growing season was less influenced by frequency of clipping than by time and degree of defoliation. Sampson and McCarty (37) found that moderate grazing or clipping once or twice early in the growth cycle had little influence on the total herbage yield of *Stipa pulchra*. But herbage removal was harmful during the summer when the growth rate was most rapid—a period when carbohydrate reserves were lowest.

### *General Conclusions*

The above incomplete resumé of the literature brings out two fairly distinct viewpoints among range conservationists and operators regarding the merits of rotation or deferred-rotation grazing. It becomes clear that regional and local conditions have much to do with the results achieved. Such factors as growth form (bunchgrass, sodgrass, stoloniferous, or rhizomatous), stocking rates, seasonal distribution of the rainfall, soil type, topography and the time factor between deferment periods, may greatly influence the outcome of the practice. However, most workers and operators seem to agree on the following points:

1. On bunchgrass range, deferment of grazing every three years or so is, as a rule,

highly beneficial to the vegetation. The grass tufts are enlarged measurably; roots penetrate more widely and deeply through the soil; the volume of forage is greater, and the larger seed crop has a higher viability; the added food reserves protect the plants against winter killing and induce earlier and more vigorous spring growth.

2. On predominantly bunchgrass ranges, especially mountain lands with abbreviated growing season, some form of rotation grazing is essential. On sod-grass range, especially at the lower elevations, moderate season-long cropping produces somewhat heavier livestock weights without apparent injury to the vegetation.

3. Natural revegetation of depleted mountain bunchgrass range of rugged topography is generally unsuccessful because of spotty over-grazing of the more accessible portions and too light cropping of the steeper slopes. Improvement of soil and cover, if any, is slow and costly.

4. Any system of rotation grazing should provide for shifting the animals so that no given portion of the range will be grazed at the same time every year—a point too frequently overlooked. This principle applies especially to early spring grazing.

5. The benefits of rotation grazing must take into account the economic returns in beef, mutton, and wool, including such costs as fencing, water development, and handling of the stock. These expenses are particularly justified on mountain bunchgrass ranges and other equally critical areas.

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## BRIEFS

Everything comes to him who hustles while he waits.—Thomas Alva Edison.



I am a great believer in luck, and I find the harder I work the more I have of it.—Stephen Leacock.