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GRAZING SYSTEMS

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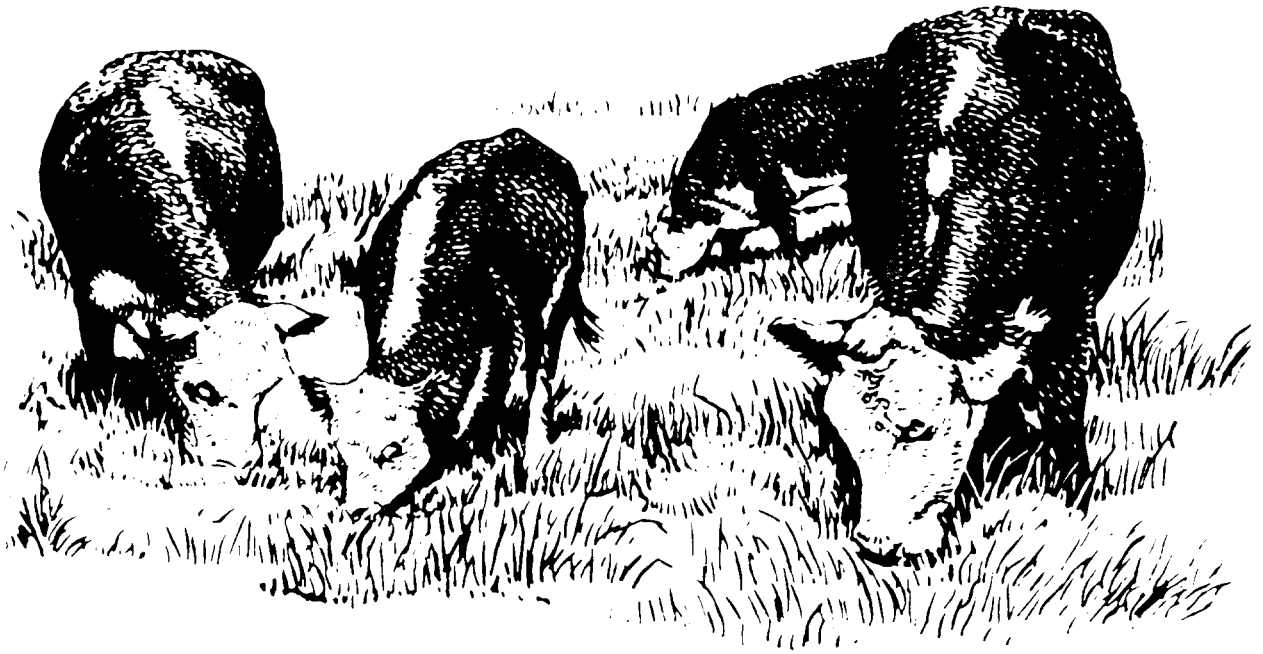

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Livestock are major consumers of roughage. In the United States, it is estimated that the percentage of livestock feed unit intake obtained from forages is 78 percent for beef cattle (including cattle in feedlots for fattening), 66 percent for dairy cattle, 89 percent for sheep and 78 percent for horses (Fig. 1). Beef cattle not in feedlots consume more than 90 percent of their feed unit intake as harvested forages and pasture.

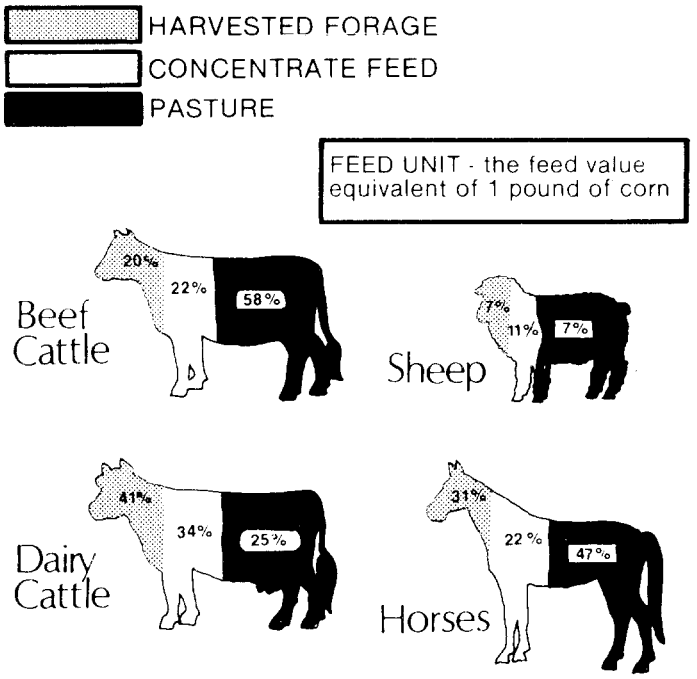

Figure 1. Percentage of diet consumed as pasture, harvested forage and concentrate feeds by livestock classes in the United States.

Forages, whether grazed or consumed as harvested hay, silage or haylage, are a major part of the diet of all livestock classes. Beef cows on a full feed of grass utilize about 70 percent of the nutrients just to maintain body weight; 30 percent of the nutrients are used for production - milk production, weight gain and reproduction. If forage is in short supply, less nutrients are available for production.

GRAZING SYSTEM — the manipulation of grazing livestock to maintain or improve the stand of forage and to provide a high level of animal production.

A grazing system involves a grazing management plan. It is just one of a number of management tools available to livestock producers to obtain uniform and proper use of forage. The use of a specialized grazing system will not provide the desired results if livestock numbers are not in balance with the forage available for grazing.

In North Dakota, native and tame grass and/or legume pastures are grazed under several different grazing systems. The grazing system used must be adapted to the individual farm or ranch. Consideration must be given to the type of livestock operation the kind and type of forage available for grazing, the number, size and/or carrying capacity of different pasture units available, availability of water in each pasture, and the relative location of pastures for easy movement of livestock between pastures. The grazing systems most often referred to in North Dakota are shown in Table 1 based on grassland or forage type available.

Table 1. Grazing Systems Used Based on Grassland or Forage Type Available.

Grazing System	Grassland or Forage Type	
	Native	Tame
Continuous	X	X
Rotation	X	X
Deferred-Rotation	X	
Switchback-Rotation	X	
Twiceover-Rotation	X	
Short Duration	X	
Complementary	X	

The definitions for the grazing systems referred to in Table 1 are as follows:

CONTINUOUS - unrestricted livestock access to all parts of a grazing unit throughout the grazing season. Sometimes referred to as seasonlong grazing.

COMPLEMENTARY - seasonal use pastures consisting of introduced perennial grasses used in combination with native grassland to improve plant vigor and/or to lengthen the grazing season.

ROTATION - the movement of livestock between two or more native pastures during the grazing season without regard for grass growth stages or season of use.

OR

The movement of livestock between two or more tame grass and/or legume pastures seeded with the same seed mixture. Sometimes referred to as "short-season" grazing.

OR

The movement of livestock between two or more pastures with different tame grasses and/or legumes and grazed in sequence based on their growth season or nutrient retaining potential if growth is saved for late season use. Sometimes referred to as "full-season" grazing.

DEFERRED-ROTATION - three or more native pastures grazed in rotation based on the growth stages of key management species. The grazing sequence of pastures in the system is changed each year to provide a different growth season of use over a period of two or more years.

SWITCHBACK-ROTATION - two pastures rotated periodically to provide periods of grazing use and non-use to maintain or improve plant vigor.

REST-ROTATION - three or more native pastures grazed in rotation based on the growth stages of key management species, with one pasture rested (not grazed) for the entire year. The grazing and rest sequence is changed each year to provide a different season of grazing and year of rest over a period of three or more years.

SHORT DURATION - eight or more native pasture units grazed in rotation for short periods, coupled with periods of rest or deferment from grazing during each grazing cycle throughout the grazing season.

NATIVE PASTURE GRAZING PLANS

Continuous Grazing is the most common grazing method used on native grasslands in North Dakota. Livestock are turned onto the pasture on the date of grazing readiness and left to graze throughout the grazing season (Fig. 2).

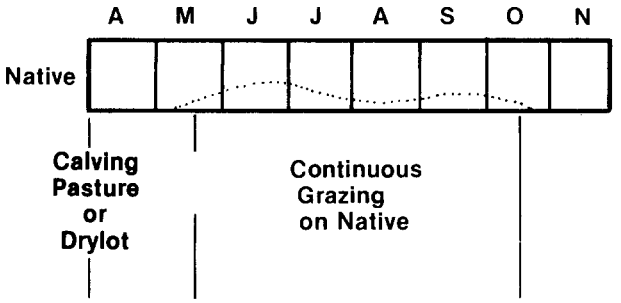

Figure 2. Relative production of native pasture by months.

The main advantage of continuous grazing is that it requires the least investment in range improvement practices such as fencing, water developments, etc. There is also a minimum of livestock handling and livestock utilize the most nutritious forage season-long. The major disadvantage is poor grazing distribution, especially in larger pastures. Livestock tend to concentrate on the same areas every year causing severe overgrazing in some areas while other areas are underutilized. Only moderate levels of stocking are possible if long term productivity of the grassland is to be maintained. This grazing method produces less animal gain per acre compared to rotation grazing due to reduced stocking rate potentials.

Rotation Grazing of native pasture may be done in different ways. A minimum of two pastures is required; however, three or more pastures are more wildely used (Fig. 3). Grazing begins on the date of grazing readiness and livestock are rotated through the system in the same sequence each year. The disadvantage of grazing in the same sequence is that early growing, cool-season grasses are always closely grazed in the spring. These grasses are using stored food to initiate new spring growth. Continued, close grazing in the spring and early summer may cause a loss in plant vigor or "health" resulting in a reduced growth rate due to low stored food reserves and an eventual thinning of the stand. Forage production will eventually decline, reducing the pasture carrying capacity.

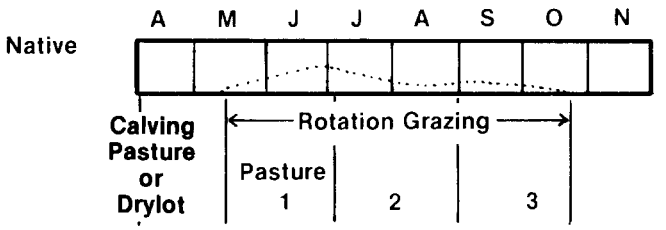

Figure 3. Relative production of native pasture by months and a rotation grazing system.

If only two pastures are available for grazing, a SWITCHBACK-ROTATION grazing system may be used (Fig. 4). This system involves rotating livestock between pastures every two to three weeks throughout the grazing season. Begin grazing on the date of grazing readiness. The first rotation cycle should be complete in about 14 days or less, especially if grazing begins on or about May 15 to 25 when the growth of grass is relatively slow. The more rapid rotation during the first grazing cycle will reduce the amount of grazing on regrowth forage and help to maintain a more vigorous stand of grass.

Deferment of grazing on native pastures is often practiced on grasslands where key management grasses need to regain their "health" and vigor. When a particular pasture is deferred, grazing should be delayed until the important forage grasses have become fully developed or have set seed. Deferment of grazing periodically (Fig. 5) on native pastures used first in the spring will improve forage production and plant vigor. If grazing cannot be deferred until the seed development stage, periodic rest or non-

Grazing Cycle	Days grazed		Total Days Grazed
	Pasture 1	Pasture 2	
1	7	7	14
2	14	14	28
3	14	14	28
4	14	14	28
5	14	14	28
6	14	14	28
Totals	77	77	154

Rotate

Figure 4. A two pasture switchback grazing system on native grassland.

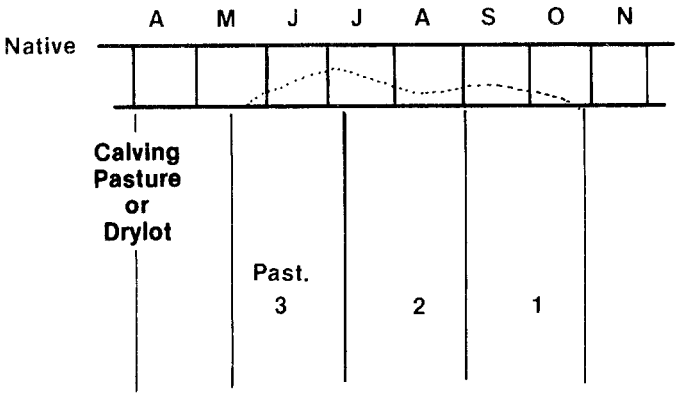

Figure 5. Relative production of native pasture by months and a deferment of grazing on pasture 1 until fall.

use similar to the switchback grazing system (Fig. 4) will be beneficial to the vegetation.

Deferred-Rotation Grazing on native grassland is a specialized system combining the concepts of deferred and rotation grazing into one system. The more specialized a grazing system becomes the more difficult it is to incorporate into a farm or ranch grazing program. A major obstacle on many farms and ranches is the location of the various pastures in relation to each other. Livestock must be rotated at different growth seasons, and ease of rotating animals becomes an important consideration.

Under this system, grazing is deferred (delayed) on a portion of the grazing unit during the grazing season for one or more years; then, by rotation, other areas can be deferred over a period of years (Fig. 6). When using the deferred-rotation system, pastures should be of nearly equal size and/or livestock carrying capacity. The advantage of the rotation system is that more livestock are concentrated on a smaller area for a portion of the grazing season, improving grazing distribution. All forage plants, including the less palatable, are utilized. In addition, plants are provided periods of non-use to store food reserves and maintain or improve plant vigor. All pastures in the system may be grazed quite close before rotating to the next pasture.

Grazing Period	Grazing Sequence by Years		
	1st Year	2nd Year	3rd Year
	Pasture Number		
Spring	1	2	3
Summer	2	3	1
Fall	3	1	2

Figure 6. 3-Pasture deferred-rotation grazing sequence by years for native grassland.

The purpose of pasture rotation and deferment from grazing is to allow plants to regain vigor, to mature seed and establish new plants. The full benefits of specialized grazing systems will not be realized until all pastures in the system have been grazed and deferred during the different growth seasons and until each pasture has received the influence of the treatment the year following grazing and deferment. Studies in North Dakota indicate that restoration of plant vigor was the major benefit from deferred-rotation grazing as seedling establishment did not occur.

Variations of the deferred-rotation grazing system are sometimes made to improve utilization of cool-season grasses and sedges before they become too mature and/or unpalatable to livestock. One variation is the **'twice over' deferred-rotation** system. An example of such a system (Fig. 7) is a variation of the deferred-rotation system shown in Fig. 6. In the 'twice over' method livestock are rotated through the system faster, resulting in more acceptable forage for livestock throughout the grazing season. During the second grazing cycle more high quality vegetative regrowth forage is available for livestock use. Other variations of the system are possible. For example, only the first two pastures grazed may be grazed "twice over" or grazing may begin on the pasture deferred until fall for a period of about 10 days, then, graze "twice over" on the first two pastures of a three-pasture deferred-rotation system. Another alternative would be to rotate through the system quite rapidly during the first cycle or in about 21 days. Then, graze "twice-over" the remainder of the grazing season.

Grazing Period	Grazing Sequence by Years		
	1st Year	2nd Year	3rd Year
	..... Pasture number		
Early Spring	1	2	3
Late Spring	2	3	1
Early Summer	3	1	2
Late Summer	1	2	3
Early Fall	2	3	1
Late Fall	3	1	2

Figure 7. Twice over grazing of a 3-pasture deferred-rotation grazing system.

Rest-Rotation Grazing is similar to deferred-rotation grazing except that one pasture in the system is rested (no use) for one full year. The purpose of the year's rest is to encourage seedling establishment, improve plant vigor and provide litter accumulation. This system is used only to a limited extent in North Dakota. It was developed on bunchgrass ranges in the western United States. Bunchgrasses, unlike sod-forming grasses, require seed production and new plant establishment to become more abundant on run-down or depleted native grasslands. A typical four-pasture rest-rotation grazing design is shown in Figure 8.

Grazing Period	Grazing Sequence by Years			
	1st Year	2nd Year	3rd Year	4th Year
	..... Pasture Number			
Spring	1	2	4	3
Summer	2	4	3	1
Fall	3	1	2	4
Rest	4	3	1	2

Figure 8. 4-Pasture deferred rest-rotation grazing sequence by years for native grassland.

Short Duration Grazing is a highly intensive method of rotation grazing. This grazing method should not be implemented unless grass and herd management practices are at a high skill level. The theory of the system is that the concentrated physical impact of grazing animals or the "herd effect" is beneficial to soil and vegetation and that short periods of grazing on small pastures coupled with periods of rest or deferment, similar to deferred-rotation grazing, reduces stress on vegetation. The system is designed with eight or more individual pastures. The theoretical stock density or cows per acre during any grazing period is two to three to produce the desired herd effect. Each pasture in the grazing unit is grazed seven days or less and receives 30 days or more rest or deferment from grazing during each rotation cycle before being grazed again. Livestock should be rotated through each pasture in each grazing cycle before regrowth on grazed plants is regrazed. Livestock can be rotated through the system faster during the early part of the grazing season when grass has a faster growth rate compared to the drier, warmer part of the growing season. During the second and later grazing cycles individual pastures are often grazed in sequence. However, grazing should be based on the growth rate of the grasses. Pastures with the most regrowth forage should be regrazed first. The number of grazing cycles obtained during the grazing season depends on the stocking rate and forage regrowth potential. If properly stocked, four to five grazing cycles are possible during the grazing season. The initial stocking rate should not be more than 50 percent above the normally accepted rate for continuous grazing.

The system may be initiated by using existing native pastures, by dividing existing native pastures into smaller grazing units or by installing a series of pastures referred to as a "grazing cell" (Fig. 9) into an existing native grassland grazing unit. It is desirable to install pastures with similar carrying capacity to make the task of rotating easier. If possible, similar vegetation types should be in each pasture to encourage uniform grazing. Regardless of how the system is designed, access to water must be provided in each pasture, between two or more pastures, or a common watering facility must be provided at the cell center.

The potential of SHORT DURATION GRAZING is currently being compared to CONTINUOUS GRAZING and the "TWICE OVER" DEFERRED-ROTATION GRAZING systems on native grassland using cow-

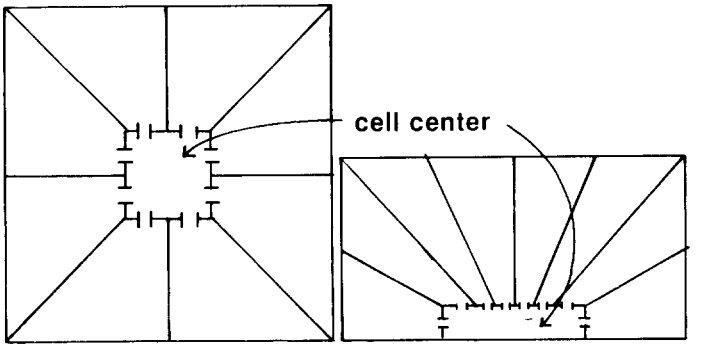

Figure 9. Short-duration grazing design layouts with a central cell center and with cell center on one side.

calf pairs at the Dickinson Experiment Station Livestock unit at Manning, ND and the Central Grasslands Experiment Station at Streeter, ND by the NDSU Animal and Range Sciences Department. Results to date indicate that the stocking rate per acre and calf gain per acre are similar between short-duration grazing and the "twice over" three-pasture deferred rotation grazing system.

Grazing on native grassland is often delayed in North Dakota because the acreage is limited for use throughout the grazing season. COMPLEMENTARY GRAZING SYSTEMS utilize introduced, cool-season perennial grasses to complement or enhance the native grassland resource. Crested wheatgrass and smooth bromegrass or both are often used for spring and early summer grazing. These introduced grasses begin growth earlier in the spring, produce more early season forage, can be grazed earlier, and fewer acres are required per cow compared to native grassland. Seeded grasses used in the spring can provide excellent grazing for 45 days or longer (Fig. 10).

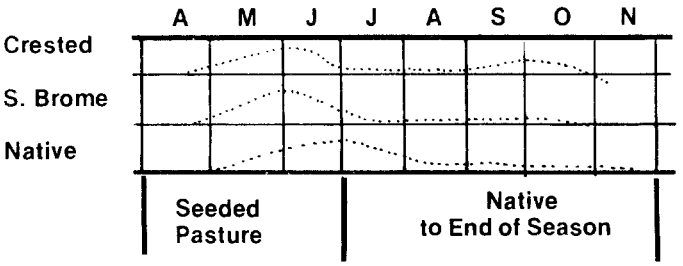

Figure 10. Relative production of native and introduced grasses by months and a complementary grazing system.

The acreage of native grassland on many farms and ranches is limited for use during both the summer and fall grazing periods. Russian wildrye and altai wildrye may be used for fall grazing if necessary. These grasses retain their nutritional value quite well when early season growth is saved for use during the fall (Fig. 11).

Complementary grazing systems are currently being evaluated at the Dickinson Experiment Station Livestock unit and the Central Grasslands Research Station. Crested wheatgrass, native grassland, Russian wildrye and altai wildrye are being grazed during the spring, summer, early fall and late fall, respectively.

SPECIALIZED GRAZING MANAGEMENT PLANS, ONCE IN OPERATION, OFTEN PERMIT INCREASED STOCKING RATES, THUS INCREASING LIVESTOCK PRODUCTION PER ACRE. IF STOCKING RATES ARE EXCESSIVE BEFORE IMPLEMENTING AN IM-

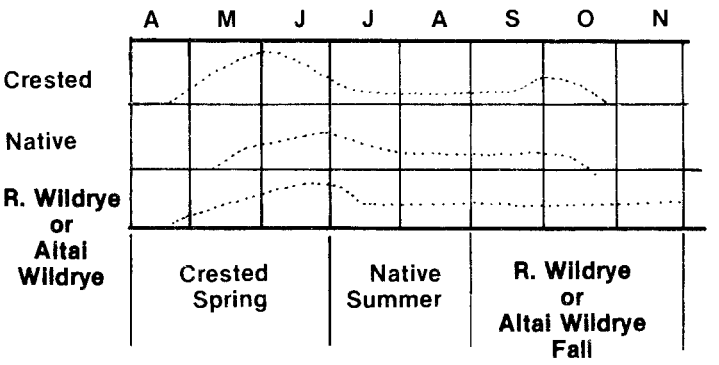

Figure 11. Relative production of native and tame grasses by months and a complementary grazing system.

PROVED GRAZING MANAGEMENT PLAN, A REDUCTION IN ANIMAL NUMBERS SHOULD BE MADE UNTIL PLANT VIGOR AND FORAGE PRODUCTION HAVE IMPROVED.

DEPENDING ON THE DEGREE OF INTENSIFICATION OF GRAZING MANAGEMENT, OBSERVATIONS INDICATE STOCKING RATE INCREASES OF 30 TO 50 PERCENT ARE POSSIBLE WHEN COMPARED TO NORMAL STOCKING RATES RECOMMENDED FOR PROPERLY MANAGED CONTINUOUSLY GRAZED NATIVE GRASSLAND.

USE CAUTION WHEN INCREASING STOCKING RATES AS SEVERE OVERGRAZING COULD RESULT.

TAME GRASS SYSTEMS

A number of livestock producers, especially in eastern North Dakota, do not have native grassland for grazing. They must depend entirely on introduced grasses and/or legumes for seasonlong grazing. The majority of the introduced forages are cool-season crops. Their forage production potential declines as the growing season progresses. Warm-season annuals provide excellent grazing during mid-summer when early growing forages decline in production.

Clipping studies show that in western North Dakota cool-season forages produce the major portion of their total forage by mid to late June. Forage yield data show that about 15 percent of total production is produced by late April, 30 percent by May 10, 55 percent by May 25, 75 percent by June 10, 90 percent by June 25 and 99 percent by early July. In contrast, at Fargo a brome-alfalfa mixture produced approximately 53 percent of its total production by June 15, 88 percent by the end of July. Fertilized bromegrass in the Fargo study produced 62 percent of its production by about mid-June, then declined

similar to the brome-alfalfa mixture. In eastern North Dakota, more of the total forage is produced later in the season due to additional moisture for growth, but the growth rate declines sharply during late summer when temperatures are high.

There are no perfect introduced grasses and legumes. None of the introduced, cool-season forage crops will provide high yields of palatable forage for a fixed number of livestock from the date of grazing readiness into the late fall.

Early grazing studies using yearling steers at Fargo show that the grazing season had to be delayed or steers removed early from continuous and rotational grazed pasture every year due to a lack of forage production. Precipitation and temperature have a major influence on potential forage production during the growing season. To provide full season grazing from early spring until late fall, several grasses and/or legumes must be planted in separate pastures for use in a planned grazing system.

The grasses and legumes planted in each pasture must be utilized during their primary growth season or grasses that retain their nutrient qualities must be used if early growth is saved for fall grazing. The use of fertilized smooth bromegrass, a smooth bromegrass-alfalfa mixture and Piper sudangrass (Fig. 12) is one possibility. Grazing can begin on the fertilized smooth bromegrass, then rotate to the brome-alfalfa mixture when 10 to 12-inches tall. Livestock can be rotated on about 21-day intervals or less if forage growth is rapid. The sudangrass should be grazed from about mid-July to early September. Crop aftermath can be utilized in the fall. The regrowth on the bromegrass and/or alfalfa pastures is best utilized after a killing frost following fall regrowth and food storage.

A study conducted at Norbeck, S.D., located in the north central portion of the state, compared a **"short-season"** and **"full-season"** tame grass and/or legume grazing system with continuous grazing of

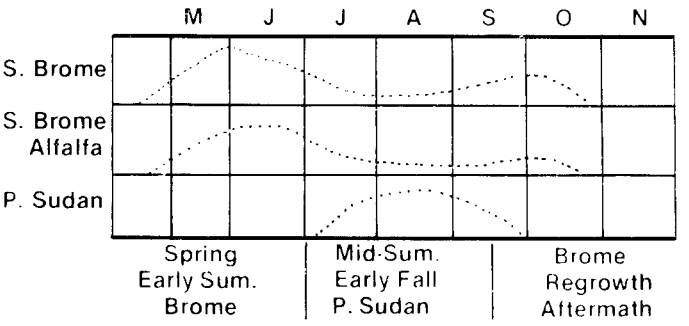

Figure 12. Relative production of tame grasses and legumes by months for grazing seasonlong.

native grassland (Fig. 13). The short-season pasture contained a mixture of smooth bromegrass, intermediate wheatgrass and alfalfa. The full-season grazing system included four different pastures - (1) crested wheatgrass (2) the "short-season" mixture (3) switchgrass and (4) Russian wildrye. Switchgrass is a warm-season perennial which is often difficult to establish. It must be grazed to a minimum stubble height of about 10 to 12 inches. Piper sudangrass, a warm-season annual, can be substituted for switchgrass in the grazing system. The full-season tame-grass pasture system produced 200 cow-calf days of grazing compared to 128 days for the "short-season" system and 181 days for native grassland.

Flexibility is the rule when using a more specialized grazing system. It is best to use the forage on the ground as a guide to when rotations should be made. A calendar date rotation can get one into trouble, especially when forage production is highly variable from year to year. Under severe drought conditions, all forage on all pastures, even a native rest-rotation pasture, may have to be used, but move back into the system as soon as possible. Remember the "proper use" concept concerning forage utilization. The saying, "The eye of the master fattens his cattle," can be applied in grassland management.

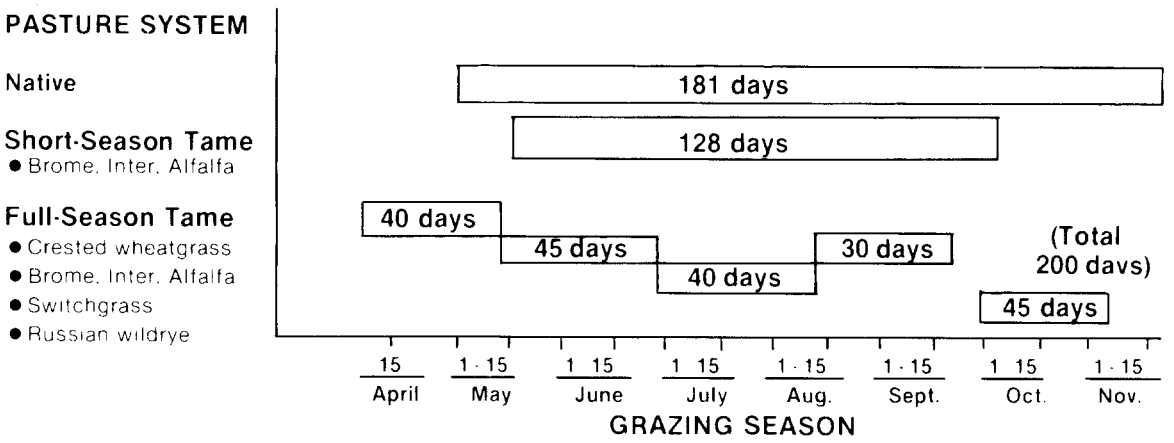

Figure 13. Average dates of grazing three pasture grazing systems. Norbeck, S.D. (1967-1972).

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