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WHY FORAGES NEED REST TOO

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Forages need rest! Understanding why they need rest will allow producers to better manage their forage resources to improve forage yield and enhance plant persistence. Ultimately, these should lead to better animal performance and greater profitability.

Continuous vs Rotational Stocking of Pastures. Grazing management implies a degree of control over both the animals and the sward. Continuous and rotational stocking represent the two extremes in grazing management. Continuous stocking is the continuous, unrestricted grazing of a pasture throughout the grazing season. Rotational stocking is the grazing of two or more subdivisions of a pasture in sequence followed by a rest period for the recovery and regrowth of the forage (Fig.1).

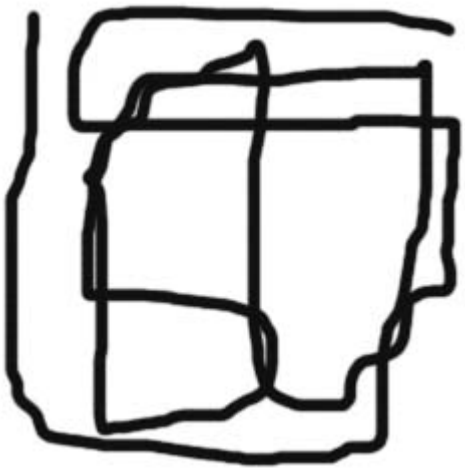
There are advantages to continuous stocking. First, there are often lower input costs because fewer watering facilities and less fencing is required. Secondly, since the livestock are not moved' there are fewer management decisions. However, there are important advantages of rotational stocking. These include improved persistence of plants in the pasture, opportunities to conserve surplus forage, and more timely utilization of forage. Certain forages, and in particular legumes like red clover and alfalfa, will not survive when frequently defoliated. Data in Figure 2 shows no yield difference in Year 1 of the study, but a consistent reduction in forage yield every year thereafter for plants defoliated every two weeks. By Year 3, plants harvested every 2 weeks are yielding about one-half that of plants cut every 4 to 6 weeks. Complete stand loss occurred for plants harvested every 2 weeks by year 6.

The low forage yield and poor persistence of plants cut every 2 weeks results from depletion of stored root reserves when plants are grazed constantly and not rested (Fig. 3). Root mass of plants harvested every 2 weeks was less than one-half that of plants cut every 4 or 6 weeks. These roots also had low concentrations of root total nonstructural carbohydrate; the starches and sugars that fuel regrowth and that are necessary for winter survival. These two factors taken together meant that roots of plants harvested every two weeks had very low amounts of root TNC (g) available for forage regrowth and plant survival. This resulted in the low forage yields and poor persistence observed in Figure 2. Provided at least 4 weeks of "rest" between harvests or grazings, higher amounts of TNC accumulate in alfalfa roots (Fig. 3) and the plants persist and yield well (Fig. 2).

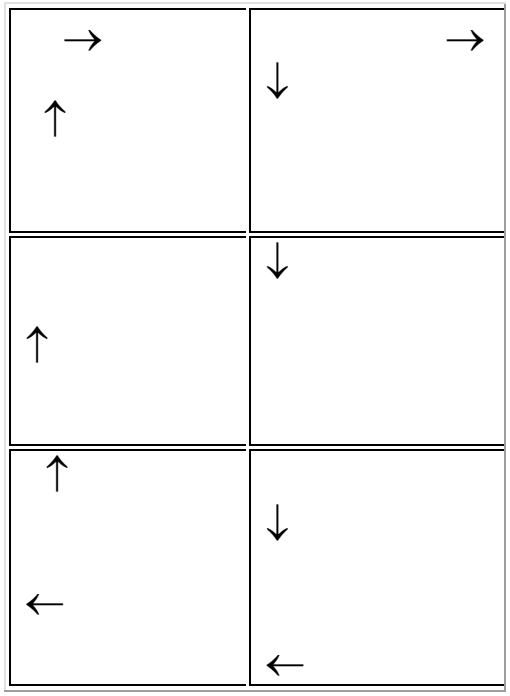
Other root reserves are critical to the successful regrowth of alfalfa in spring and after harvest in summer. Forage harvest removes essentially all top growth, and results in a dramatic decline in N fixation rate of alfalfa and other forage legumes. This very low rate of N fixation persists for two to three weeks, after which N fixation returns to pre-harvest levels. Since we rarely fertilize forage legumes with N and soil N levels are often very low, these plants use root N reserves to supply the N needs of regrowing shoots. Essentially all N found in regrowing shoots is derived from roots during the first week of regrowth (Fig. 4). By the time these alfalfa plants are ready to harvest again 30 days later, one-half of the N found in shoots was mobilized from root N pools. Plants with low root N levels regrow slowly after harvest and do not persist. Therefore, factors that influence root N accumulation can alter regrowth, yield, and persistence of alfalfa. This includes soil pH, phosphorus and potash nutrition, and harvest schedules that permit re-accumulation of root N (approximately 4 weeks between harvests). Therefore, forages need rest between harvests to ensure adequate root reserves are present for shoot regrowth and plant persistence.

Animal gain per acre can also be improved by rotational grazing (Table 1). Calf gain per day was similar for both stocking methods, but because of the heavier stocking rate per acre, calf gain per acre was 87 lbs greater for the rotational stocking treatment. Cow gain per acre also showed a slight advantage with rotational stocking and contributed to the 100 lb/acre greater beef production when compared to continuous stocking. Rotational stocking also permitted 0.5 ton/cow/calf pair hay production that was not possible with continuous stocking. This hay production approaches 25% of the hay necessary for the winter feeding period.

As shown above, rotational stocking can improve both plant and animal performance, but it does have limitations. It requires more input of management and capital because of the additional fencing and watering requirements. In addition, pastures late in the rotation sequence may have lower forage quality because of advanced maturity of forages unless precautions are taken. These include harvesting some of the paddocks as conserved forage in spring followed by rotational stocking the remainder of the year; and/or reducing the time on an individual paddock to 3 to 5 days



Continuous Stocking



Rotational Stocking: 6 days per paddock; 30 days rest between grazings.

Figure 1. Examples of continuous and rotational stocking. After Matches and Burns (1995).

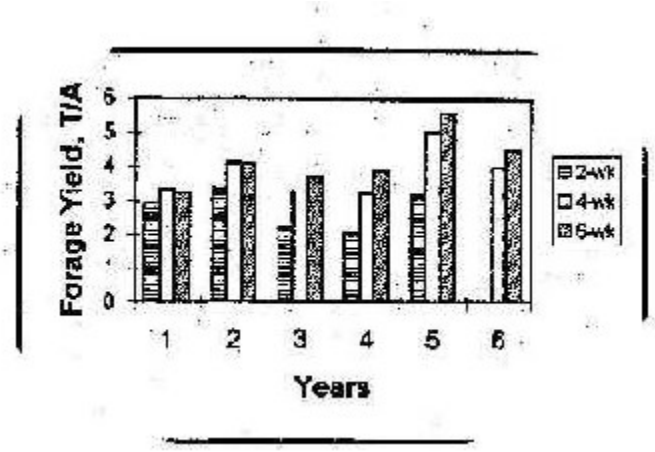


Figure 2. Influence of defoliation frequency (2 vs. 4 vs. 6 week intervals) on alfalfa yield and persistence.

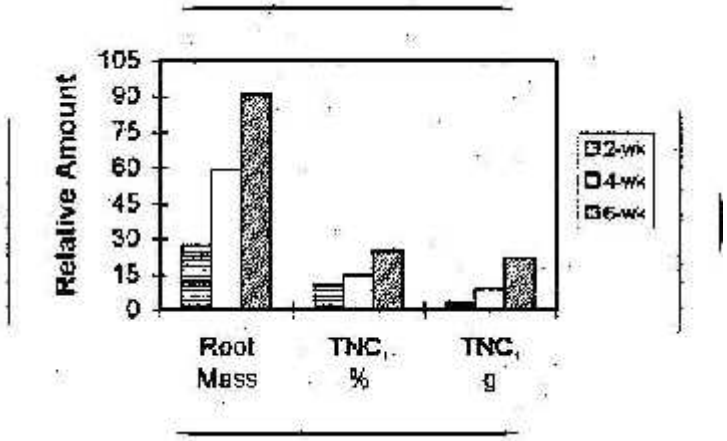


Figure 3. Influence of defoliation frequency (2 vs. 4 vs. 6 week intervals) on root mass (g/plant) concentration of root total nonstructural carbohydrates (TNC, % of dry weight) and quantity of root TNC (g TNC/plant).

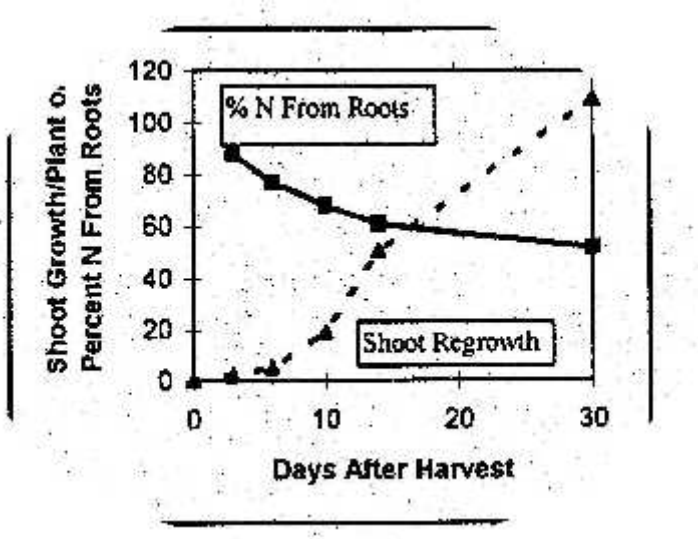


Figure 4. Use of root N reserves during shoot regrowth of alfalfa after harvest on Day 0. Adapted from Ourry et al.

Table 1. Influence of the stocking system upon cow-calf performance at Southern Purdue Agriculture Center. Adapted from Hendrix, Johnson, and

Potts.		
Variable Measured	**Continuous Stocking**	**Rotational Stocking**
Cow-calf pairs, no.	12	23
Acres of Forage	24	43
Acres per cow-calf pair	2.0	1.3
Calf gain, lbs/day	1.90	1.97
Calf gain/acre	160	247
Calf weaning weight, lbs.	481	489
Cow gain lbs/day	0.46	0.41
Cow gain/acre, lbs.	39	52
Total beef gain/acre, lbs.	199	299
Hay yield, lbs./cow-calf pair	0	1062