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R.K. McGuffey and Don Hillman Department of Dairy Science
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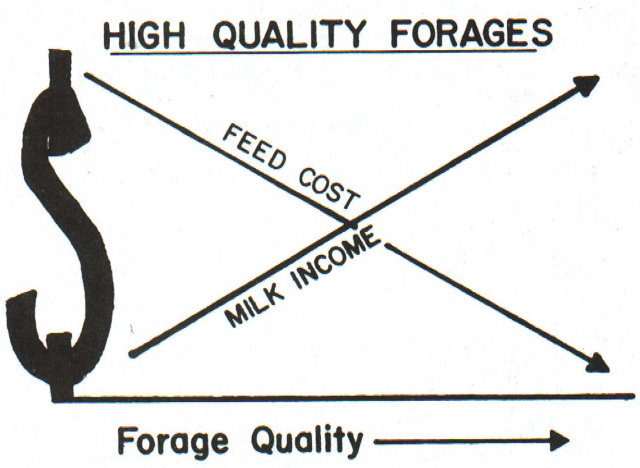
Harvest Forages Early for Maximum Production

R. K. McGuffey and Don Hillman
Department of Dairy Science

Production of high quality forages for dairy cattle substantially reduces feed costs and increases milk income. Forage quality is based primarily on available energy and protein content. Energy concentration is expressed as total digestible nutrients (TDN), digestible dry matter (DDM), or digestible net energy (DE). Protein is expressed as either crude protein (CP) or digestible protein (DP).

Energy comprises 70 to 80% of the nutrients required by cattle for maintenance and production. Energy is the major feed cost nutrient particularly when grain is expensive. High quality forages can supply a major portion of the energy requirement providing a relatively cheap source of energy.

Milk production is proportional to the amount of energy consumed above maintenance requirements. Thus, a high intake of energy is essential for a high level of milk production.

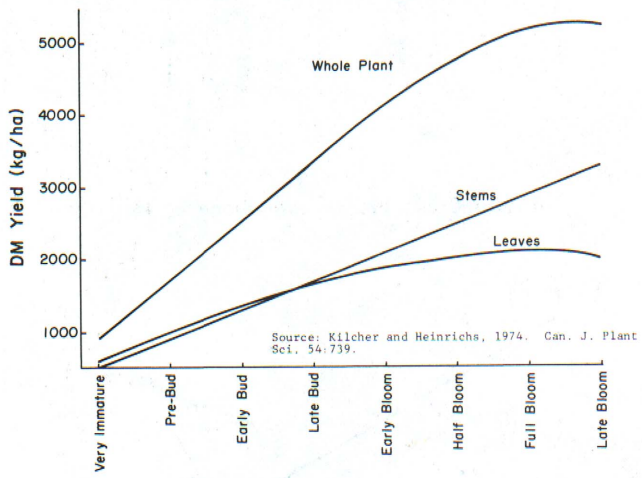


Factors Affecting Forage Quality

The goal of any forage program should be obtaining maximum yield of digestible nutrients per year. For a given year, the factor that affects yield and quality most is date of first cut.

Yield of dry matter (DM) and the contributions of leaves and stems to that yield at different stages of maturity of first growth alfalfa are shown in Figure 1.

FIGURE 1. Alfalfa Dry Matter (DM) Yield with Stages of Maturity



Total dry matter yield increases at a constant rate from the very immature stage to the half-bloom stage of maturity. Thereafter, yield increases but at a declining rate. Dry matter yield from stems increases at a constant rate throughout the growing stage. Leaf DM yield, however, increases at a constant rate through the early-bloom stage. Little increase in leaf DM yield occurs thereafter. Advancing maturity of the plant is characterized then by an increased dry matter yield and a decreased leaf-to-stem ratio.

Advancing maturity decreases the feeding value of forages. Changes in digestible energy (DE) with advancing maturity are shown in Figure 2. Whole-plant DE decreases from the very immature to the early bloom stage and then slows. Digestible energy of the stem decreses rapidly to early bloom, remaining constant thereafter. Leaf DE decreases from 74% to 71% throughout the growing stages thus changing very little. It becomes obvious that harvesting at the proper stage of maturity with methods that preserve leaves results in forages of high digestible energy content.

Forages, especially legumes, are also an important source of protein. Crude protein (CP) content of alfalfa with advancing maturity is shown in Figure 3. Whole-plant CP decreases with advancing maturity. The de-

FIGURE 2. **Alfalfa Digestible Energy with Stages of Maturity**

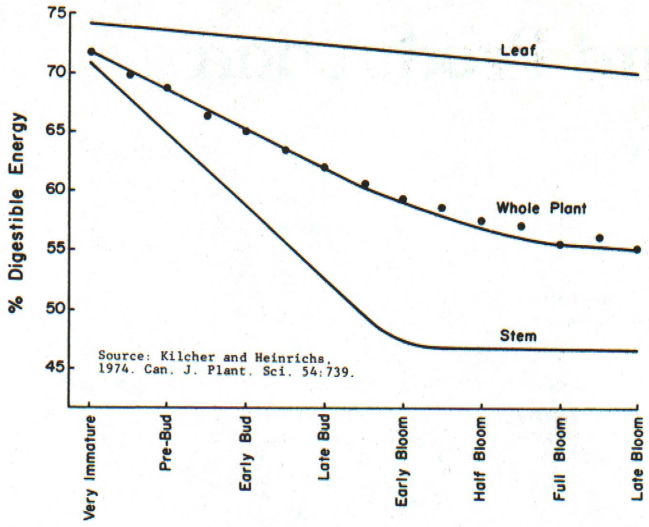
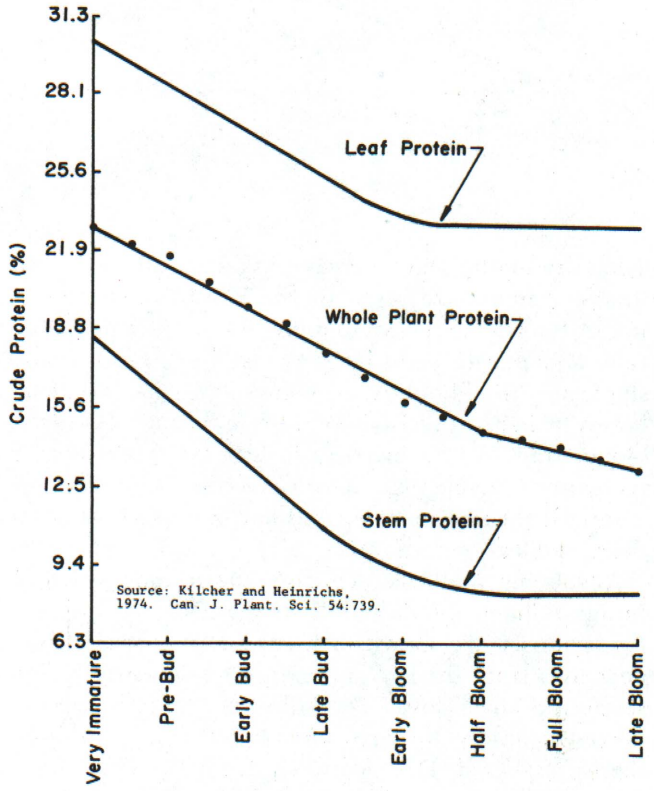


FIGURE 3
Alfalfa Crude Protein with Stage of Maturity

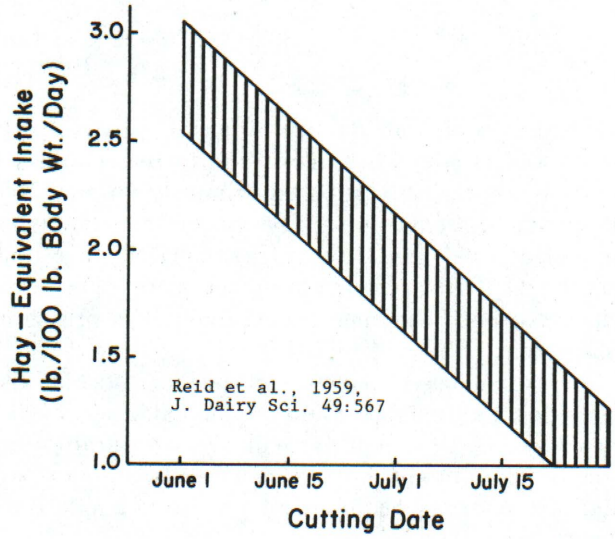


crease is faster in the early growth stages than the later growth stages. Crude protein content of leaves and stems decreases at similar rates; however, leaves contain a much higher percentage (twice or more) of CP than stems. Again, this emphasizes the importance of early harvest and using harvesting methods to preserve plant leaves.

Animal Response to Forage Quality

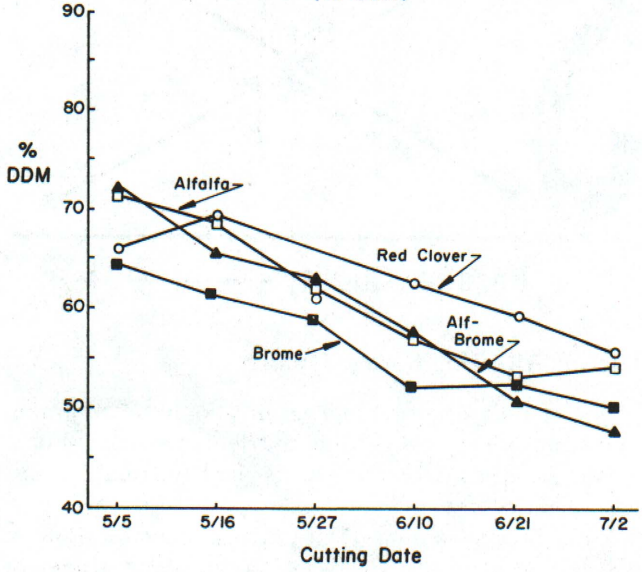
Much research has been directed to developing methods to predict forage quality but the truth remains that the best indicator of forage quality is the cow. Forage intake decreases with delayed cutting (Figure 4).

FIGURE 4. **Effect of Cutting Date on Intake of First-cut Forage**



Research data indicate that this decrease in forage intake is about 2% for each day cutting is delayed. This decrease in intake corresponds to a decrease in forage digestibility. Data for several forage species show that digestibility decreases with advancing maturity (Figure 5). Forage digestibility decreases about 0.3 to 0.5% for each day cutting is delayed regardless of forage species.

FIGURE 5. **Digestible Dry Matter (% DDM)**



Source: Baumgardt and Smith, 1962. Wisc. Agr. Exp. Sta. Res. Report 10.

Production response to forages harvested at different stages of maturity is shown in Table 1. Cows were fed similar amounts of concentrate and were offered alfalfa hay *ad libitum*. Forage intake was greatest for forage harvested at the early-bud stage of maturity and decreased as maturity advanced. Milk production followed a similar trend to forage intake. For each one pound increase in forage consumption, there was a corresponding increase of one pound of milk.

TABLE 1

Impact of stage of growth on feed intake and milk production by cows fed low levels of concentrates

Item	Growth Stage		
	Early Bud	1/10 Bloom	3/4 Bloom
DM intake (lb)			
Concentrate	8.4	8.6	8.1
Forage	34.2	30.8	26.3
Total	42.6	39.4	34.4
Daily milk (lb)			
4% FCM	40.4	37.1	32.8

Spahr et al., 1961. J. Dairy Sci. 44:503.

Maximum Yearly Nutrient Yield

As stated previously, the goal of any forage program should be obtaining maximum yield of nutrient per year. The date of first cut not only affects forage yield and quality but also yields of succeeding cuttings. Data in Table 2 illustrate this. Three cutting schemes of alfalfa were employed to determine yearly yield and quality. The three schemes were as follows: A) 3 cuttings, early (1/10 bloom); B) 3 cuttings, late (full bloom); and C) 2 cuttings, late. For the year, scheme A produced 1,240 and 1,760 pounds more dry matter, 478 and 692 pounds more crude protein and 1,128 and 1,540 pounds more total digestible nutrients than schemes B and C, respectively.

Economic Value of Early vs. Late Cut Forage: Data from Tables 1 and 2 were used to calculate the value of milk produced from an acre of alfalfa (Table 3). Dry matter yield of the 3 cuttings, early scheme in Table 2, was paired with forage intake and milk production from 1/10 bloom alfalfa in Table 1. Three cuttings, late and two cuttings, late (Table 2) were paired with forage intake and milk production and from ¾ bloom alfalfa (Table 1). The pounds of milk per acre at the production level of similar forage is about 1,100 and 1,700 lb greater for 3 cuttings, early than for 3 cuttings, late and 2 cuttings, late, respectively. At a milk price of $8.50 per cwt. an acre of alfalfa cut 3 times, early is worth $93 and $146 more than 3 cuttings late and 2 cuttings late schedule, respectively. These results clearly indicate the profitability of early cut forage.

TABLE 2

Calculated yield of nutrients per acre per year from Vernal alfalfa with various cutting schedules

Cutting Schedule	Yield per acre (lb)		
	DM	CP	TDN
3 cuttings, early			
Total	10640	2199	6483
10% bloom, early June	4575	980	2814
10% bloom, mid July	3618	701	2189
10% bloom, late August	2447	518	1480
3 cuttings, late			
Total	9400	1721	5355
Full bloom, late June	5264	882	2937
Full bloom, late August	3290	588	1812
Bud, early October	846	251	596
2 cuttings, late			
Total	8880	1507	4943
Full bloom, late June	5772	932	3221
Full bloom, late August	3108	575	1722

Baumgardt and Smith, 1962. Wisc. Agr. Exp. Sta. Res. Report 10.

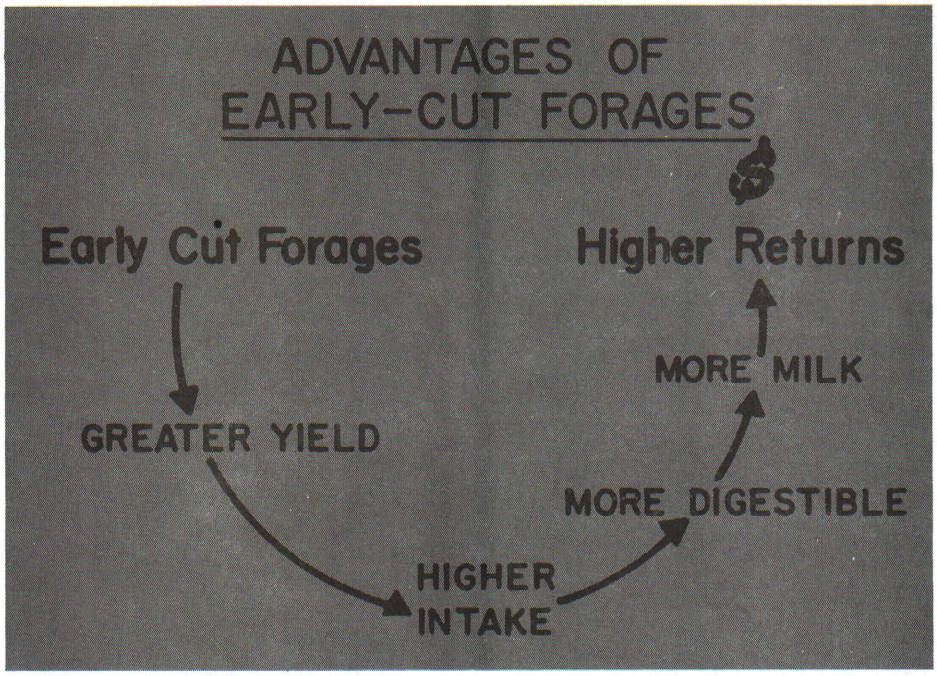
TABLE 3

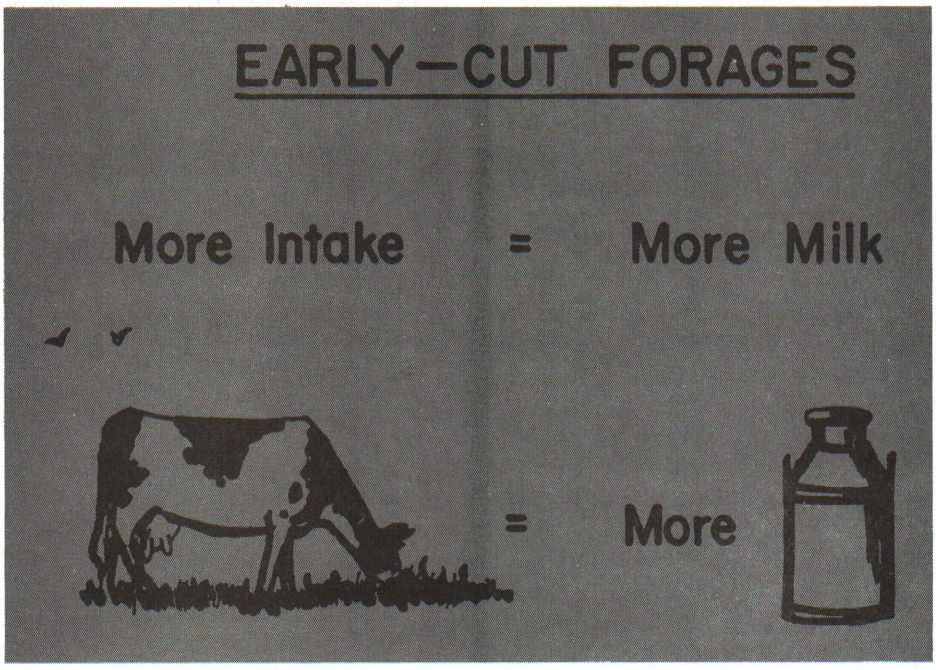
ECONOMICS OF MILK PRODUCTION AND FORAGE CUTTING DATE

	3 Cuttings Early	3 Cuttings Early	2 Cuttings Early
D.M. Yield/Acre	10640	9400	8880
Forage Intake	30.8	26.3	26.3
Animal Days/Acre	345	357	338
Milk Production/Day	37.1	32.8	32.8
Pounds Milk/Acre	12800	11710	11086
Dollar Value @ 8.50/cwt	$1088	$995	$942

Summary

High quality forages provide energy and protein at substantially lower cost than corn or soy. Forages harvested early (about 1/10 bloom for legumes) produce maximum yearly yield of nutrients and greater intake, digestibility and production. Early harvested forages provide a large proportion of the required nutrients for high producing dairy cows. The dairy cow responds with increased milk production from forage harvested at the correct stage of maturity. This increased milk production means higher returns per acre of harvested forage.





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