

# EFFECTS OF FALL AND WINTER HARVESTS ON ALFALFA YIELD AND QUALITY

George F. Worker and Vern L. Marble<sup>1</sup>

**Abstract:** A study to determine the optimum timing for the last harvest date in a fall-winter cutting system was established at the Imperial Valley Agricultural Center. CUF 101 alfalfa was planted October 2, 1984, with two seedling harvests, early and late, and four fall-winter harvest treatments starting the second year with the December 5, 1985 cutting. Early and late seedling harvest affected dry matter yield only for the first, second and third harvests, but total first year production was 9.92 and 9.71 tons of dry matter for early and late harvests, respectively, not significant at the 5% level.

The second year yields all obtained after the first fall-winter treatments were made, differed significantly at the first cutting (3/7/86) but total dry matter production for cuts one through eight (March-October), ranging from 8.83 to 9.40 tons dry matter per acre, was not significant. However, when both fall and winter harvests were included, the yield of this "normal" treatment was significantly higher than when no fall-winter cuts were made. There were no differences between either one cut in December, one in late January, or both cuts (normal). The TDN and crude protein content of the hay produced by the March 7 harvest for the two-cut "normal" fall-winter harvest treatment and the treatment harvested in January. High quality winter hay was not possible to produce unless cuttings were taken in December and January. The first year total production of excellent quality hay would be 8.21, 8.20, 9.19, and 10.49 tons of dry matter per acre for no-cut, late January, and early December and normal (both) harvests, respectively.

The same trend occurred in the third year production after the second year of fall-winter treatments. If hay quality is similar to the first year, yield of excellent quality hay would be 6.74, 6.49, 7.55, and 8.29 for no-cut, early December, late January and normal treatments, respectively. Two years of fall-winter harvesting indicate that with the very nondormant CUF 101 there is no advantage in skipping either one or two harvests during the fall-winter period.

**Keywords:** Alfalfa, Fall-winter harvest, TDN, Crude protein, Harvest schedule.

## INTRODUCTION

The low desert grows approximately 25% of all the alfalfa produced in California, with growing conditions different from those in central and northern California. There is a lack of information on the overall effect of harvesting and grazing in the fall and winter after a normal last cutting or grazing. Studies to determine the effect of fall-winter cutting on productivity, hay quality, and pests were established in the fall of 1983 at the West Side Field Station and U.C. Davis, and in the fall of 1984 at the Imperial Valley Agricultural Center. Parameters measured included yield in subsequent years, stand decline, hay quality, and pest invasion (EAW and BAA).

## METHODS

The experiment at the Imperial Valley Agricultural Center consisted of planting CUF 101 alfalfa October 2, 1984, with six replications and four fall-winter harvest treatments composed of cutting at two different harvest dates (Table 1), in four treatment combinations. The "normal" treatment is considered to include both fall (December) and winter (January) harvests, usually 10 cuts per season.

The area planted in 1984 enabled us to include an early and a late seedling stage harvest. The early harvest was January 8, 1985, and the late harvest was January 28, 1985, with the next cutting on all plots March 7, 1985.

---

<sup>1</sup>Specialist in Agronomy (Retired), Imperial Valley Agricultural Center, University of California, 1004 East Holton Road, El Centro, CA 92243 and Extension Agronomist, University of California, Davis, CA 95616

## RESULTS AND DISCUSSION

### Seedling Year

Results of the effect of seedling harvests are shown in Table 2. There was a significant yield difference between the treatments at the first harvest (seedling harvest), in favor of the late harvest, as compared to the second harvest (3/7/85). The total combined alfalfa yields of the first and second cut were an identical 2.01 tons dry matter per acre for both treatments. There was a significant yield increase at the second (3/7/85) and third harvest (4/15/85) of the early seedling cut over the late seedling cut. There were no differences by the fourth cut in April. The yearly total dry matter production was 9.71 tons per acre for the late seedling cut, and 9.92 tons per acre for early seedling harvest. The difference, 0.21 tons, was not significant at the 5% level, but there does appear to be a trend in favor of the early January harvest date.

### Second Year

Dry matter yield results, as affected by fall-winter harvest treatments in 1985-86, are reported in Table 3. The results are a little hard to explain. Quality data could determine the best harvest practices. The normal, all cuttings, schedule produced 2.44 tons per acre of dry matter through the fall and winter (12/5/85, 1/24/86, 3/7/86) compared to 1.19, 1.78, and 1.55 tons per acre dry matter for no fall-winter, one early December, and one late January cut, respectively. If accumulated forage available in early December is not harvested (approximately 0.77 T/A) it is essentially lost through leaf loss and frost by the second date of January 24, 1986, as judged by its similar yield of 0.71 T/A and on equivalent (0.88 T/A) production for the normal treatment which had been cut in December.

The treatments had no significant yield effect on the second through the eighth cutting on 10/26/86 (Table 3). If one omits the two fall-winter and the first cutting (3/7/86), the dry matter yields were equal at 8.21, 8.18, 8.20, and 8.04 T/A, not significant at the 5% level. One sequence of fall-winter harvests only influenced the yield of the March 7 cutting. The hay quality of the no-cut, early (December) and late (January) cuts were low (Table 4), and were unacceptable as dairy quality hay, thus lowering their yield of excellent quality hay to 8.21 and 8.95 T/A of dry matter, respectively, compared with 9.04 for late (January) cut and 10.49 tons of dry matter per acre for the normal harvest.

The hay quality of the 3/7/86 harvest ranged from a poor 50.4 for the no-cut, to 54.8% TDN for either the normal (all) or late (January) harvest, and a corresponding 21.9 to 24.9% crude protein, both significant at the 5% level (Table 4). High quality fall and winter alfalfa hay was only possible when both the December and January cuts were made. Fall-winter harvesting had no effect on quality after the March 7 harvest.

### Third Year

Dry matter yields, as affected by two years of fall-winter harvests, are reported in Table 5. As in 1986, hay quality could determine the advantage of the fall-winter treatments. The normal harvest treatment yielded 2.43 tons per acre of dry matter through the fall-winter period (12/10/86, 1/30/87, 3/25/87) compared to 1.10, 1.69, and 1.43 tons per acre of dry matter for no-cut, early (December), and late (January) fall-winter harvests, respectively. The hay quality of the 3/25/87 harvest could be affected by the no-cut and early harvest treatments, as in 1986. There was a significant yield increase at the second cutting (4/25/87) for no-cut and late (January) cuts, with 1.41 and 1.47 compared to 1.24 and 1.29 for early and all normal cuts. Even though this trend continued, by the third cut in May, the no-cut and late January cuts yielded 1.70 and 1.71 compared to 1.61 and 1.48 tons of dry matter per acre for early December and all normal harvests, respectively. There was no difference between the treatments at the fourth, fifth, and sixth cuttings, nor for the total harvested hay through the sixth cutting August 2, 1987.

If one omits the two fall-winter and one first cutting (3/25/87), there was no significant difference in the dry matter production of 6.74, 6.49, 6.77 and 6.26 for no-cut, early (December), late (January) and normal cuttings, respectively. The hay quality of the no-cut, early (December), and late (January) cuttings would be unacceptable, thus lowering their yields of excellent quality hay to 6.74 and 6.49 tons dry matter per acre, compared to 6.77 for late (January) cut and 8.29 for normal harvest.

The first three years of data indicate that there was a 5-10% advantage in yield and quality from taking all harvests during the late fall or early winter in Imperial Valley, and that 10 harvests per season can be made on CUF 101 without any reduction in total seasonal yield using the schedule of 40-45 days between October and December, 45-50 days from December to January, and 40 days from January to March.

#### SUMMARY

Two years of harvesting the fall-winter treatments indicates that there was no advantage from missing one or two harvests during the fall and winter months in Imperial Valley. We can also conclude that if one skips a cutting in January, the quality of the alfalfa hay harvested in early March will be very poor, far below that required to sell to dairies. A third conclusion would be that there is a significant affect in higher yields in the March and April cuttings when there were no harvests after the end of October until the beginning of March. However, with the yield reduction from not cutting in the fall and/or winter, combined with a poor quality March harvest from the uncut treatment, we must agree again with the first conclusion stated in this paragraph, but stated in another way; that continuous harvesting of alfalfa throughout the fall and winter months in the low desert does not reduce yield. On the contrary, it will increase total seasonal yield of high quality hay by at least 5-10% per year.

#### ACKNOWLEDGMENTS

The cooperation of Dr. Bill Lehman, Larry Gibbs, Joe Gutierrez, and the staff at the Imperial Valley Agricultural Center is appreciated.

Table 1. Fall and winter harvest treatments for CUF 101 alfalfa planted at Imperial Valley Agricultural Center of October 2, 1984.

Treatment	Estimated date of harvest			
	Fall cut	Winter cuts		Spring cut
Normal harvest	October	December	January	March
Early harvest	October	December	---	March
Late harvest	October	---	January	March
No winter harvest	October	---	---	March

Table 2. Effect of an early first harvest on the productivity of CUF 101 alfalfa during the year of establishment. Planted October 2, 1984 at Imperial Valley Agricultural Center, El Centro, California.

Treatment	Tons per acre of dry matter						
	1985 Harvest dates						
	Seedling 1/8	1/28	Cut 2 3/7	Total 1st + 2nd cut	Cut 3 4/1	Cuts 4-9	Total
Early harvest	0.60	--	1.41	2.01	1.05	6.86	9.92
Late harvest	--	0.88	1.13	2.01	0.92	6.78	9.71
LSD (.05)	0.10		0.21	ns	0.13	ns	ns

To convert dry tons per acre to hay at 2% moisture, multiply by 1.136.

Table 3. Second year yield summary for 1984 Imperial Valley fall and winter harvest trial. Planted October 2, 1984 at Imperial Valley Agricultural Center, with six replications.

Treatment	Fall-winter harvests No. of cuts	Yield in dry matter tons per acre						
		Winter cut		Cut 1	Total fall-winter cuts	Cuts 2-8	Total Cuts 1-8	1986*
		12/5/85	1/24/86					
No cut	0	--	--	1.19	1.19	8.21	9.40	9.40
Cut early	1	0.77	--	1.01	1.78	8.18	9.19	9.96
Cut late	1	--	0.71	0.84	1.55	8.20	9.04	9.75
Normal	2	0.78	0.88	0.79	2.44	8.04	8.83	10.49
LSD (.05)		0.05	0.16	0.25	0.36	ns	ns	0.77

\*Total 1986 equals cuttings 1 through 8 plus the winter cut(s).

To convert dry tons per acre to hay at 12% moisture multiply by 1.136.

Table 4. Effect of fall-winter harvest treatment on TDN\* and crude protein of CJF 101 alfalfa planted at Imperial Valley Agricultural Center on October 2, 1984.

Treatment	TDN - Percent				Crude Protein - Percent			
	12/5/85	1/24/86	3/7/86	4/11/86	12/5/85	1/24/86	3/7/86	4/11/86
No cut	--	--	50.4	50.3	--	--	21.9	19.3
Cut early	51.8	--	52.3	49.9	21.6	--	22.4	19.0
Cut late	--	50.87	54.8	49.7	--	19.6	25.1	19.1
Normal cut	52.1	55.3	54.8	50.0	21.5	24.0	24.9	19.3
LSD (.05)	ns	0.18	1.36	ns	ns	3.36	2.19	ns

\*At 90% dry matter, per the University of California modified crude fiber prediction system.

Table 5. Third year yield summary for 1984 Imperial Valley fall and winter harvest trial. Planted October 2, 1984 at Imperial Valley Agricultural Center, with six replications.

Treatment	Fall-winter harvests No. of cuts	Yield in dry matter tons per acre							
		Winter cut		Cut 1	Cut 2	Cut 3	Cuts 4-6	Total Cuts 1-6	1987*
		12/10/86	1/30/87						
No cut	0	--	--	1.10	1.41	1.70	3.63	7.84	7.84
Cut early	1	0.74	--	0.95	1.24	1.61	3.64	7.44	8.18
Cut late	1	--	0.65	0.78	1.47	1.71	3.59	7.55	8.20
Normal	2	0.76	0.57	0.70	1.29	1.48	3.49	6.96	8.29
LSD (.05)			ns	0.17	0.20	ns	ns	ns	ns

\*Total 1987 equals cuttings through 6 plus winter cut.

To convert dry matter tons per acre to hay at 12% moisture multiply by 1.136.