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The Effect of Stand Density on Yield of Irrigated Alfalfa in Central Oregon



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SUMMARY

A study was conducted to determine the density of stand necessary to produce optimum yields of alfalfa under irrigation in Central Oregon. During the three years of the study, significantly higher yields were consistently produced by the highest densities of 4 or 8 plants per square foot, as compared to the lowest densities of 0.67 or 1 plant per square foot. The average annual difference in yield between the lowest and highest producing stands was 1.86 tons of hay per acre. In terms of current hay prices (\$65 per ton), farmers who maintain a low-density stand of alfalfa in Central Oregon lose \$120.90 income per acre each year.

INTRODUCTION

Plant population is one of the major factors affecting productivity of an alfalfa stand. A sparse stand produces less hay than a dense one (1,2,3). During the life of a stand, hay yields usually decline because of various reasons, including lowering of soil fertility and pH (below 6.0) levels, disease, injury, and general mismanagement. Some of these problems can be corrected and hay production thereby increased, but if plants have been lost from the stand, the damage cannot be repaired. Consequently, plant population is the first aspect to consider when deciding whether to rejuvenate a stand and maintain it in production, or to plow it under and replant.

To use plant population as a deciding factor on the life of a stand, it is necessary to know the minimum density, the point it no longer pays to

maintain the stand. This study was conducted to determine the density of stand necessary to produce optimum yields of alfalfa under irrigation in Central Oregon.

EXPERIMENTAL PROCEDURE

Vernal alfalfa was overseeded in 12-inch rows on June 10, 1972, at the Central Oregon Experiment Station, Redmond. In October, it was thinned to densities of 0.67, 1, 2, 4, and 8 plants per square foot.

The plots were irrigated with 1½ inches of water every 5 to 7 days during the course of the study. Fertilizers were applied according to soil test recommendations. The plots were harvested three times each year, usually at 10 percent bloom.

RESULTS AND DISCUSSION

Stand density had a significant effect on yield of alfalfa hay during all three years of the study. The stands having the highest densities of 4 or 8 plants per square foot consistently produced the highest hay yields (Table 1). During the last two

Table 1. Yield of Vernal alfalfa hay at different plant densities.

Plants per square foot	Yield			
	1973	1974	1975	Avg.
	tons hay/acre			
0.67	4.94 f*	4.69 d	3.46 c	4.36
1	5.80 e	5.24 cd	3.91 bc	4.98
2	7.28 bc	5.85 a-c	4.50 ab	5.88
4	7.97 ab	6.14 ab	5.18 a	6.43
8	8.38 a	6.45 a	5.06 a	6.63

* Values within a year column followed by different letters are significantly different at the 5 percent level of probability by Duncan's New Multiple Range Test, which is a statistical test to compare treatment averages and determine if they are different.

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years of the study, high yields were also produced by the stand having a density of 2 plants per square foot. The stands having densities of 0.67 or 1 plant per square foot consistently produced hay yields that were significantly lower than those from the other stands.

During 1974 and 1975, hay yields were lower from all plant densities than they were in 1973. The lower yields were probably due to poor growing conditions (cold spring temperatures) during the last two years. The average annual difference in hay yield over the three years between the two highest and two lowest producing stands was 1.86 tons per acre.

A stand count taken after the final harvest showed that the respective plant populations had remained essentially the same during the study.

CONCLUSIONS

The results show that stand densities of 2 to 4 plants per square foot are required to obtain optimum yields of alfalfa under irrigation in Central Oregon. If a stand has a density of less than 2 plants per square foot, it should not be maintained in production. In terms of current hay prices (\$65 per ton), the farmer who maintains a low-density stand of alfalfa in Central Oregon loses \$120.90 income per acre each year.

LITERATURE CITED

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