

Raising Dryland Rye Hay



Station Bulletin 592
Agricultural Experiment Station

April 1963
Oregon State University, Corvallis

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This bulletin is a contribution from the Squaw Butte Experiment Station, Burns, Oregon. This station is financed cooperatively by the Crops Research Division, ARS, USDA, and the Agricultural Experiment Station, Oregon State University, Corvallis.

Raising Dryland Rye Hay

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Summary

This was found

1. Critically low crude protein content in rye was measured in years of favorable amounts of precipitation.
2. Delaying harvest three weeks after rye had flowered resulted in 1) losses of approximately 50% in the crude protein per acre; and 2) only slight gain in total yield.
3. Nitrogen fertilization up to 60 pounds N/acre did not result in profitable increases.
4. Marked increase in hay yields from low amounts of N were obtained in a favorable moisture year.
5. Slightly greater yields were returned through annual cropping, yet the extra yearly costs of annual cropping suggest that biennial cropping was more economical.

This is recommended

1. Chemically analyze hays in favorable moisture years to help guide the rancher in the subsequent winter feeding program.
2. For best hay quality and near maximum yields harvest rye while in flower.
3. Do not use nitrogen fertilizer on dryland rye soils typified by the Squaw Butte study.
4. Use of 15 to 30 pounds N/acre may, in the more favorable locations within the sagebrush-bunchgrass range, profitably increase the yield of rye hay.
5. Biennial cropping probably will be more economical than annual cropping.

Introduction

Ranchers have had little choice but to accept the use of cereal rye for hay production in the high desert area of eastern Oregon. Other cereal grains, although they provide a better quality hay, have not produced as high a yield as rye. The high desert soils are often subject to harsh, open winters. This inflicts winter injury on fall-established cereals. Nevertheless, rye is one cereal that ranchers can and have used to provide a hay of good quality in most years when it is harvested at the proper time.

Approximately 30,000 acres in eastern Oregon are devoted to rye hay production. On these acres, there are few common farming practices among ranchers for raising dryland rye hay. Rye is cropped annually or biennially, seeded in the fall or spring, and harvested at all stages of

maturity—from early flower to hard seed. These differences at times are only a fenceline apart.

Ranchers growing rye for dryland hay do have something in common. Each is faced with a need to increase hay production, and each is becoming more concerned about the quality of the hay being fed in a winter feeding program. Both of these needs have resulted from a desire to “winter” beef animals on a higher plane of feed intake and quality.

Investigations at Squaw Butte conducted over the past five years provide information about fertilization and date of harvesting rye for hay grown either annually or biennially. More specifically, the effects of these variables on hay yields, crude-protein content, and total crude-protein production were studied.

Crude-Protein Content Critical in Wet Years

Regardless of cropping system, rye in the favorable moisture years of 1957 and 1958 contained relatively low concentrations of crude protein, even though it was harvested at the early-flower stage of development.

Recommended feeding practices suggest that the ration fed to wintering beef animals should contain at least 7% crude protein. On the basis of the results obtained (Fig. 1), ranchers should be concerned about the quality of their rye hay in favorable moisture years.

Crude protein of the rye hay in dry years was well above the 7% minimum level. Indeed, in 1961, the hay contained such large concentrations (12% or more) that one might consider feeding such hay in conjunction with a lower quality roughage to more efficiently utilize the total feed resource, or it might be fed to growing animals.

Biennially cropped rye contained higher concentrations of crude protein that did rye cropped annually.

Low crude-protein concentration of rye hay was associated with relatively optimum hay yields. Favorable moisture during the crop-year resulted in maximum hay yields (Fig. 2). Mean production in T/A (tons/acre)

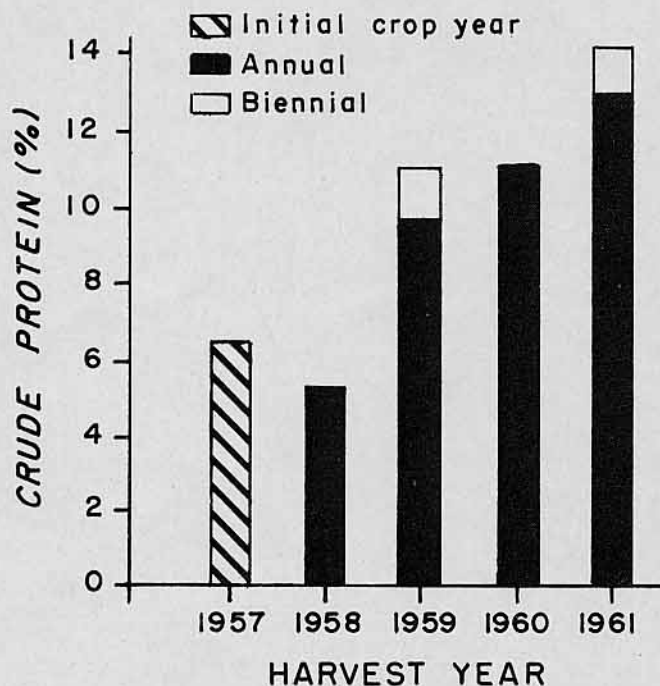


Figure 1. Crude-protein content of unfertilized rye hay harvested on June 14 (early flower) and cropped annually or biennially.

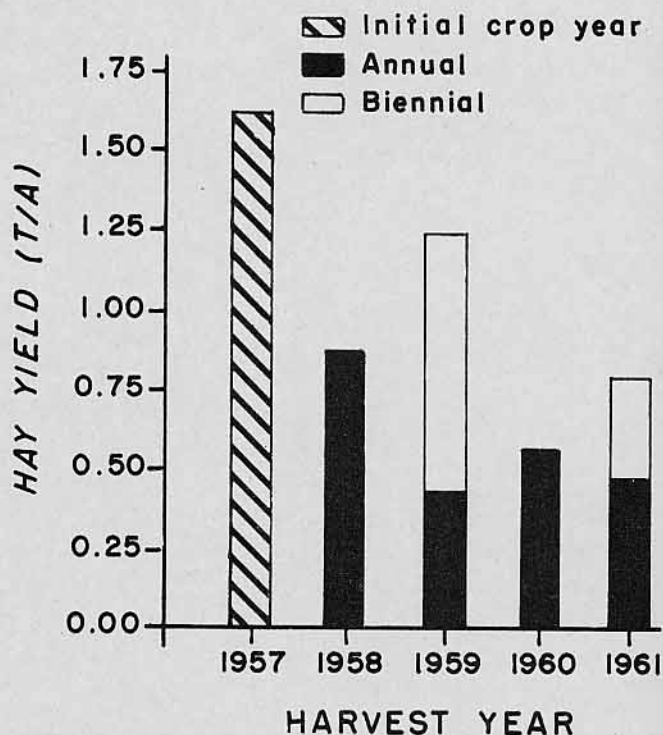


Figure 2. Yields of unfertilized rye hay harvested on June 14 (early flower) and cropped annually or biennially.

was 1.00 and 0.58 for biennial and annual cropping, respectively. Maximum yield occurred in 1957 with 1.61 T/A being produced from a biennially cropped stand. The lowest yield (0.43 T/A) occurred in a dry year from stands cropped annually.

There are other reasons—important ones—why the crude protein content of these hays should be viewed critically. In recent years, studies concerned with the nutrient level of hay and its affect on digestibility have been important to many ranchers. In general, the digestibility of a roughage low in crude protein content can be enhanced by the addition of small amounts of supplemented nitrogen. The rancher who knows the level of crude protein content of his hay can, with the help of his county Extension agent or feed adviser, supplement to obtain the most efficient use of his hay. He is then in a position to feed his cattle a better quality ration, and when necessary he can stretch his limited hay supply over a longer period of time. The old saying, "you get back just what you put in" is true in cattle ranching too: "Quality beef are raised on quality rations."

Cut Rye Hay at the Flowering Stage

Delaying the harvest of rye three weeks beyond the flowering stage resulted in approximately 50% less crude-protein concentration in the hay—based on the average for all years and cropping systems. Mean crude-protein content by harvest dates and cropping systems is shown in Figure 3. Crude protein was lost from rye grown biennially at a near steady rate once flowering had occurred; rye cropped annually lost a greater proportion of its total crude protein in the first seven days after flowering.

Delaying the harvest of rye three weeks beyond the flowering stage resulted in losses of approximately 45% of the total amount of crude protein present in the plant at flowering time. Under biennial cropping, the average crude-protein yield was 244 pounds per acre when rye was in early flower; only 128 pounds of that total was measured in the rye hay harvested three weeks later. Here too, losses in rye plants cropped annually were greatest during the first week following flowering (Fig. 4). Losses in rye plants cropped biennially showed a more consistent loss trend through the three-week period.

Delaying the harvest of rye three weeks beyond the flowering stage resulted in losses of crude protein valued at \$3.50 to \$9 per acre based on replacement costs. Replace-

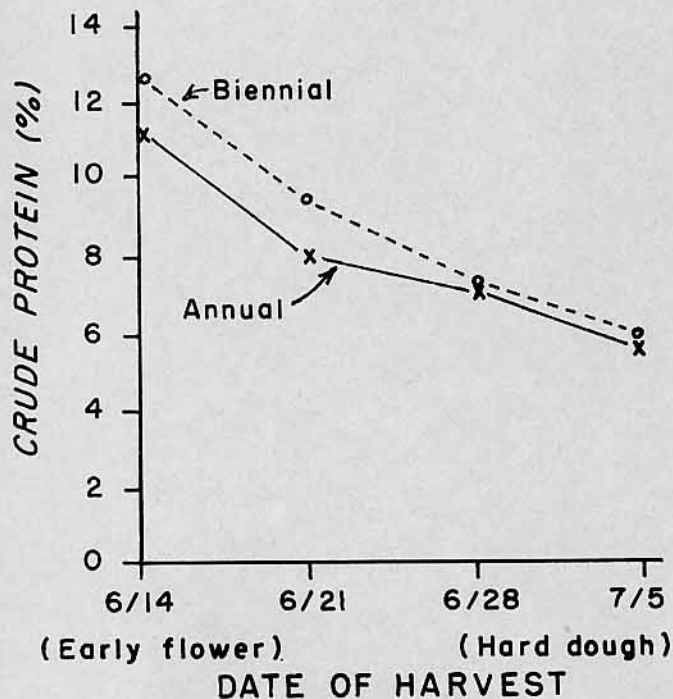


Figure 3. Crude-protein content of unfertilized rye hay cropped annually or biennially.

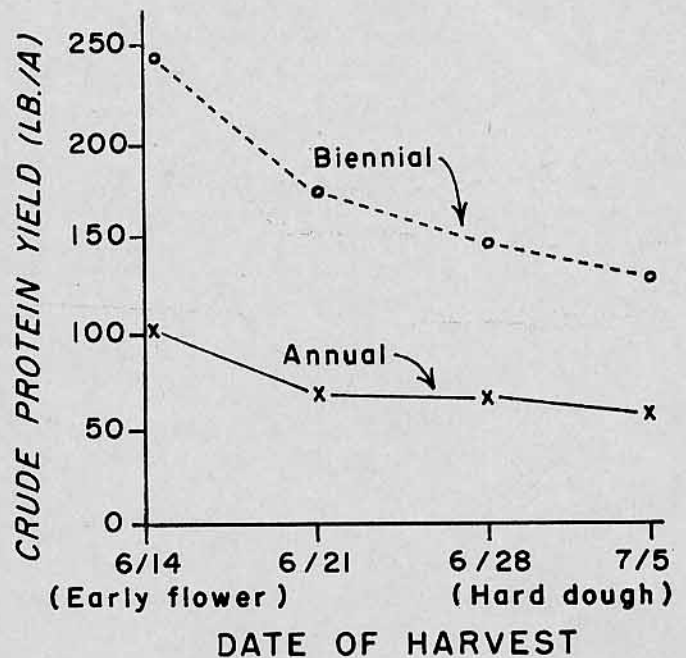


Figure 4. Crude-protein yields of unfertilized rye hay cropped annually or biennially.

ment costs of the crude protein lost are presented in Table 1—using 43% cottonseed meal valued at \$70 per ton (cost of a pound of crude protein was approximately 8¢).

Over half of the crude protein that was lost in the three-week-period had disappeared from the aerial portions of rye by the end of the first seven days. Ranchers need to keep this in mind; for in order to save this crude protein in hay, the harvesting operation will need to move along at a quick pace.

Table 1. Replacement Costs of Crude Protein Lost by Delaying Cutting of Rye Hay

Date of harvest	Crude-protein yield		Accumulative replacement cost	
	Annual lb./A	Biennial lb./A	Annual \$/A	Biennial \$/A
June 14	102	244
June 21	70	173	2.56	5.68
June 28	67	145	2.80	7.92
July 5	58	128	3.52	9.28

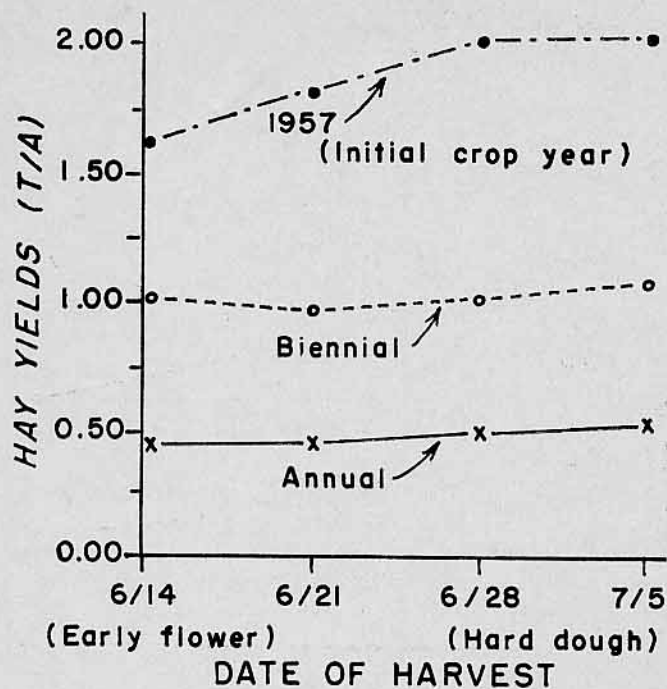


Figure 5. Average hay yields of unfertilized rye cropped annually or biennially.

Nitrogen Fertilizer Usually Not Beneficial

Only in the extremely favorable year of 1958 did nitrogen applications significantly increase the yield of rye cropped annually and cut at an early-flower stage. However, in that year 60 pounds of N per acre depressed yields considerably below those obtained at 15, 30, and 45 pounds of N per acre (Fig. 6). The reverse situation occurred in the dry years, with either no increase in yield occurring or a significant decrease in yield when fertilized with more than 15 pounds of N per acre, as in 1961. Since it is not possible, at least at present, to forecast favorable years prior to fall fertilization, the overall conclusion is that nitrogen fertilization will not increase yields enough to justify its cost. However, the fact that yields were increased in the wettest year, suggests that, on areas of higher precipitation or more favorable soil sites, 15 to 30 pounds of N per acre might be profitable.

The small response of rye grown biennially to nitrogen fertilization shows that nitrogen was not a limiting factor in hay production under the conditions of this study (Fig. 7). Apparently, available soil nitrogen accumulated in the fallow year in sufficient amounts to permit a reasonably efficient use of available soil moisture.

Despite small increases in yields due to applications of N, the increase in the crude-protein content of the rye was not large (Fig. 8). Crude-protein content of rye grown annually was significantly increased with 30 pounds or more of N per acre. Surprisingly, significant increases in

Depending upon the favorable conditions of the year or the stage of maturity of rye when harvested, rye hay may vary from a very nutritious, desirable feed to a low quality roughage. Biennially cropped crude-protein yields, valued at 8¢ per pound, result in estimated hay values of:

Rye harvested in early flower: \$19.50 per ton.

Rye harvested in late dough: \$10.20 per ton.

Rye harvested in a late-dough stage or later may not be worth \$10.20 per ton, as we can be sure that along with the loss of crude protein, the digestibility of the hay has decreased. One can also assume that carotene has been lost along with loss in green color.

Delaying the harvest of rye beyond the flowering stage resulted in a slight, but nonsignificant, increase in average hay yields for each cropping system (Fig. 5). However, hay yields (annual) increased when soil moisture remained high following flowering. Even then, the increase in yield was worth less than the loss of crude protein which occurred as a result of delaying harvest.

The loss of crude protein was greater and more rapid in dry than in wet years and more rapid at an earlier date in rye cropped annually. Both observations suggest that in cutting rye for hay, the more droughty portions of the seeded area should be cut first, if one is to harvest the maximum amount of crude protein from the entire rye crop.

crude-protein content of rye cropped biennially were not obtained with less than 45 pounds of N.

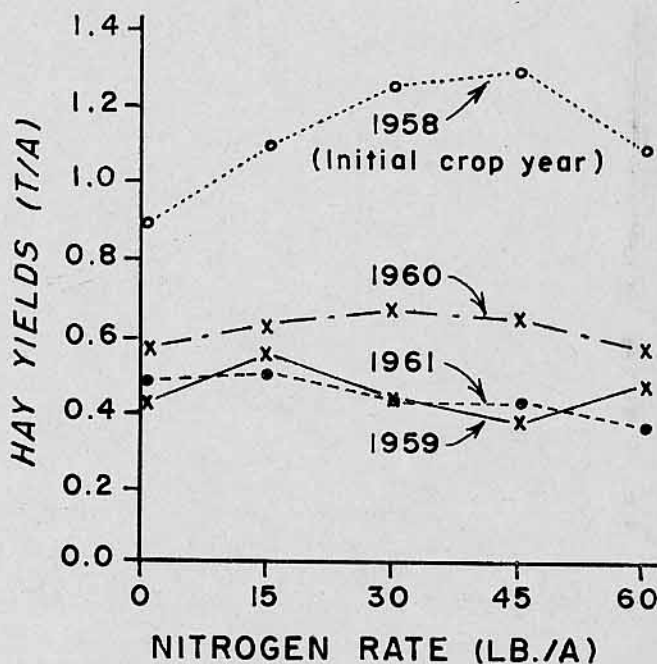


Figure 6. Effect of nitrogen on yields of annually cropped rye harvested on June 14 (early flower).

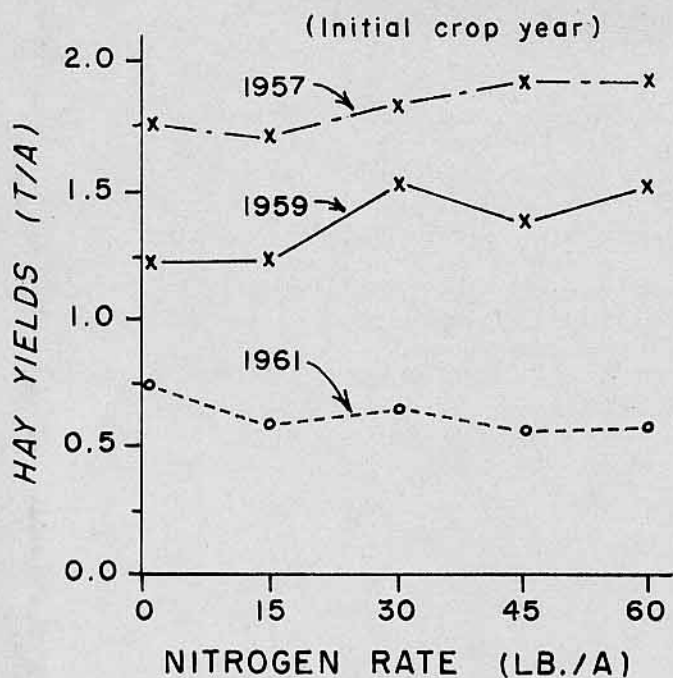


Figure 7. Effect of nitrogen on yields of biennially cropped rye hay.

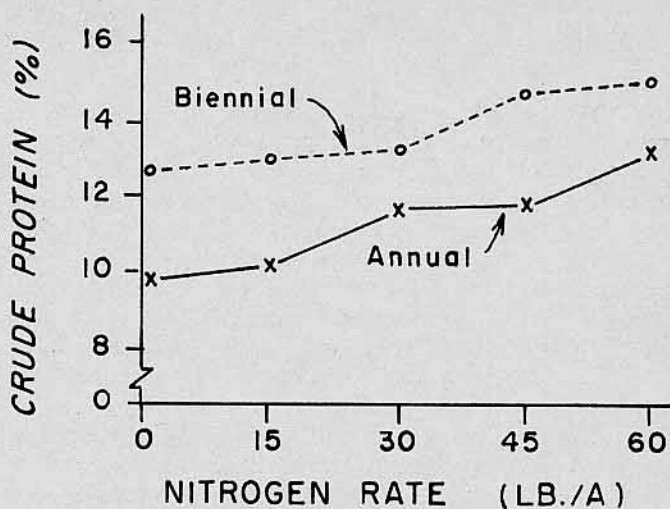


Figure 8. Effect of nitrogen on crude-protein content of rye hay harvested on June 14 (early flower).

Biennial Versus Annual Cropping

In each of the four years, 180 pounds more hay was produced under the annual cropping system. The cost of this additional 180 pounds of hay can be listed as follows: (1) 40 pounds of rye seed at approximately \$88 per ton, (2) cost of drilling the seed, and (3) cost of harvesting the year's crop. The cost of land preparation is not included, since an equivalent land operation was necessary in the fallow year of the biennially cropped plots in order

to maintain a fallow. The seed cost alone makes the estimated cost of this additional hay approximately \$20 per ton. If the remaining costs are figured, even conservatively, increased hay production under the annual cropping system becomes rather expensive. Despite the shortness of the study, yields obtained and costs involved in obtaining those yields suggest that biennial cropping is the more economical operation.

Description of the Study Area

The Squaw Butte range station is located 42 miles west of Burns, in southeastern Oregon at a mean elevation of 4,500 feet. The area is typical of the vast sagebrush-bunchgrass range that dominates the Oregon high desert. Soils are sandy-loams originating from extensive basalt flows that overran much of the area in the geologic past. They are shallow, varying in depth from 2 to 4 feet, and often underlain with a caliche hardpan that is indicative of the percolation depth of the 11.0 inch average September through June, precipitation. Most of the precipitation is received during the winter months as snow, but about one-third falls as rain during the growing

season months of April, May, and June. Crop-year precipitation amounts for the study years were as follows:

Crop-year	Sept.-June precipitation
	<i>Inches</i>
1957	13.1
1958	16.2
1959	6.1
1960	9.7
1961	7.2

Methods Used

The experimental area was plowed out of sagebrush-bunchgrass range in 1954, but remained in a weedy state through 1955 and 1956. In the fall of 1956 and prior to seeding in subsequent years, the plots were disced and harrowed. Plots were drilled to rye in September using a standard grain drill calibrated to deliver 40 pounds of rye seed per acre. The seed used was commercial rye obtained locally. Nitrogen was surface-applied each fall following the seeding operation. Application rates were 0, 15, 30, 45, and 60 pounds of elemental nitrogen per acre in the ammonium-nitrate form.

In the crop-years 1957, 1959, and 1961, effects of harvest dates were measured. In those years, on plots seeded annually and biennially, the first harvest was ob-

tained when rye was in early flower (June 14 \pm 3 days) and three subsequent harvests were taken at seven-day intervals. In the crop-years 1958 and 1960, yield harvests were taken only at the early-flower stage from plots seeded annually, because the biennial plots were in fallow.

Hay-yield samples were oven-dried, weighed, ground, and retained in sealed jars for crude protein determinations. Hay yields reported herein were computed at 10% moisture content.

Crop years 1958, 1959, 1960, and 1961 contribute to annual cropping; 1959 and 1961 contribute to biennial cropping. The data obtained in 1957 has been used throughout the bulletin as supplemental data.