

Quick starting of seedlings and better plant survival were the primary results of fertilization for alfalfa seed production, according to three years of trials at the West Side Field Station, Fresno County. Alfalfa seed yields were not influenced by fertilizer applications (singly or in combinations) of nitrogen, phosphorus, potash, gypsum or minor elements when used on established stands. Plant distribution and density of stands were definitely shown to be factors in alfalfa seed setting. Thinning within the row was found beneficial, and the best three-year average yields were in thinned stands where rows were spaced 24 to 48 inches apart. The indicated dates to cut back stands to start a seed crop were from April 10 to 20 at this location.

Nitrogen and phosphorus (15 to 20 units of each) applied, at or before planting, and slightly below or to one side of the drilled seed, were beneficial in establishing stands, but usually failed to show an increase in yield.

Effect of fertilizer, row spacing and clipping on

ALFALFA SEED

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First-year stands

In first-year stands, thinning within the row was beneficial for all row-widths. The amount of thinning (see Table 1) required to improve seed yields varied with different row-widths, ranging from 12 inches to 18 inches in 24 and 36-inch row spacing to 6 inches in wider spaced rows. In solid drill-row stands, 36-inch spaced rows were superior, but 48-inch spaced rows were only slightly lower in yield. The 24 to 42-inch spaced rows were better adapted to direct harvest. Rows spaced 48 inches and wider required spe-

cial attention to avoid heavy losses of seed in harvest.

Second-year stands

In second-year stands, seed yields from row-spacing and within-row thinning were outstandingly good for demonstrating the effects of plant distribution and density of stands on seed yields. The highest yields in 1960 (see Table 1) were with 24-inch spaced rows when thinned to 6 × 18 inches (thinned 6 × 18 inches indicates 6 inches of row remaining, 18 inches of row removed or "blocked" out) in treatment No. 2 (T-2) and 6 × 36

GAMMA RADIATION DEVICE

aids study of water movement in soil

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The ability of soil to transmit water affects the rate, frequency and method of irrigation—and can often limit cropping possibilities in non-irrigated areas. Knowledge can be obtained on water movement through soil by measuring changes occurring after different periods of time. The gamma ray apparatus measures soil moisture on the basis that fewer gamma rays will pass through a wet soil than a dry soil.

In the laboratory setup, water movement is measured by using a glass-enclosed soil column placed between two lead shields as shown in photo and diagram. Gamma rays emitted from a radioactive cesium source are directed through lead slits of less than .05 inch width. As the gamma rays pass through the soil, they are electronically detected and analyzed. Selected radiation from the analyzer is received by the rate meter and transferred to a recorder. Data from the recorder can be read directly to show a continuous measurement of water content with time. The soil column is translated to the left and right for continuous water content measurements at different locations along the column.

Previous methods of water movement through soil involved slow or inaccurate procedures. Gravimetric procedures necessitate the destruction of each sample and valuable time is consumed for oven drying. Many other methods required

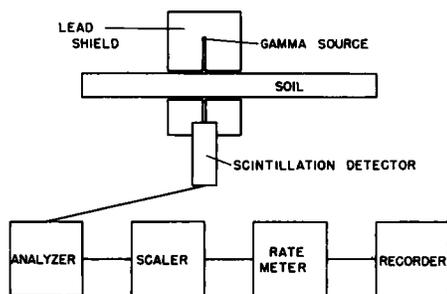
PRODUCTION

inches (T-3); 36-inch spaced rows thinned to 6 × 6 inches (T-6); 6 × 12 inches (T-6); 6 × 18 inches (T-7); 6 × 24 inches (T-8); and 48-inch spaced rows thinned 6 × 12 inches (T-11). Plant populations were: 24-inch spaced rows, 6 × 18 inches, 16,300 plants, and 6 × 36 inches, 9,300 plants compared to 65,300 plants in unthinned 24-inch spaced rows; 36-inch spaced rows had 21,700, 14,400, 10,800, and 8,700 plants, respectively, compared to 43,500 unthinned. In the 48-inch spaced rows, there were 10,500 as compared to 32,600 plants in the unthinned stand.



A first-year stand of skip-row planted alfalfa for seed production.

such a large sample that theoretical considerations of the water movement problem were nearly impossible. Variations of the dissolved constituents in the soil solution also make water determinations by other methods unreliable.



In addition to using the gamma ray device to understand how water moves through soil, it may be used directly for other problems in agriculture. Soil moisture extraction patterns by plant roots growing in greenhouse pots may be measured without plant disturbance. Soil compaction experiments may be carried out with great precision owing to the ability of the gamma device to measure bulk densities with extreme accuracy.

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Third-year stands

In the third year of production 24-inch spaced rows thinned 6 × 18 inches and 36-inch spaced rows thinned 6 × 6 and 6 × 18 inches yielded best. Plant size in the 1961 season prevented lodging, and this condition permitted all of the better treatments (2, 3, 4, 5, 6, 7 and 8) to produce similarly. Yields of seed went up and managerial problems increased as the stands advanced in age (see both tables). The control of harmful insects, the elimination of volunteer seedlings and weeds, and the correct application of irrigation water were the main problems.

Row spacing is a factor in alfalfa seed production and can improve yields when adapted to the soil type and the available water for irrigation.

Within-row thinning proved beneficial throughout the life of the stands when adapted to the particular row-widths, soil type and total water availability.

Skip-row trials

Skip-row plantings, two rows in and one out, proved superior on certain soil types. This was particularly the case on lighter soils where water penetration was more rapid and a lesser moisture storage capacity per unit volume of soil became a limiting factor to growth of higher plant populations. Under these circumstances yields were improved 20 to 30 per cent. The reverse was true on the heavier soils where moisture holding capacity was higher and smaller plants prevented lodging. Here yields were in favor of 36-inch spaced rows with no out rows. Better water management and improved pest control were factors contributing to the improved yield of skip-row plantings.

Clipping dates

Clipping data for 1959, 1960, and 1961 (see Table 2) indicated that April 20 was the best date to clip during this period,

TABLE 1—ROW SPACING, THINNING, PLANT POPULATION AND YIELDS OF ALFALFA SEED

Treatment number	Row & spaced inches apart	Thinned		Plants/acre	Per cent yield when T-4 = 100 per cent in			3-year average
		Left in inches	Removed inches		1959	1960	1961	
1	24	solid		65,300	95	87	92	91
2	24	6	18	16,300	107	114	106	109
3	24	6	36	9,300	80	123	100	101
*4	36	solid		43,500	100	100	100	100
5	36	6	6	21,700	114	110	101	108
6	36	6	12	14,400	119	118	98	112
7	36	6	18	10,800	105	116	101	107
8	36	6	24	8,700	100	109	95	101
9	36	6	36	6,200	77	97	85	86
10	48	solid		32,600	98	97	90	95
11	48	6	12	10,500	96	116	81	98
12	48	6	24	6,500	75	88	87	83
13	72	solid		21,100	76	80	82	79
14	72	6	6	10,500	86	88	88	87
15	72	6	12	7,000	76	77	71	75

* The yield of No. 4: 1959, 634; 1960, 1074, and in 1961, 1413 pounds/acre.