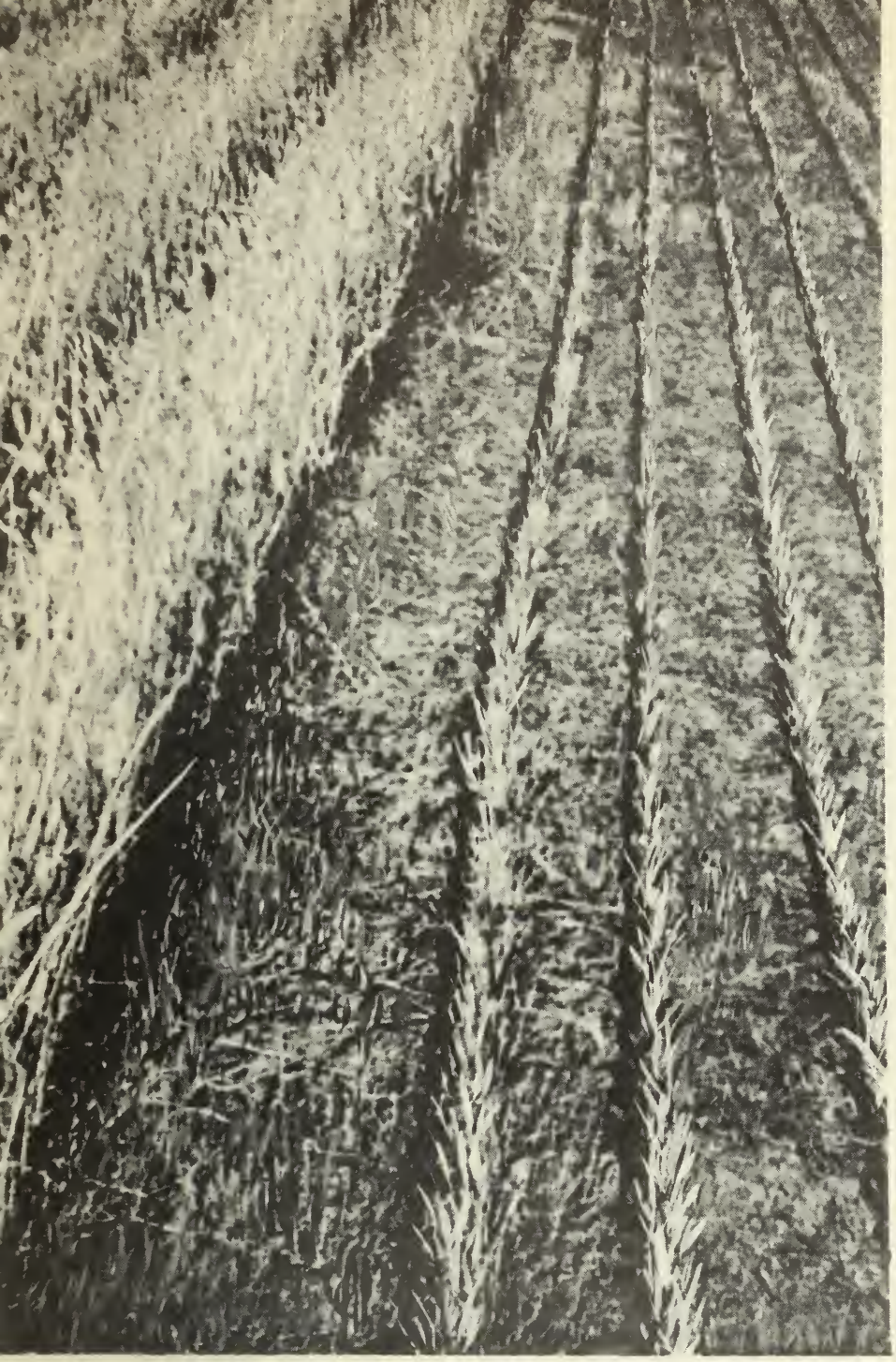

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IN THE BROWN SOIL ZONE OF SASKATCHEWAN

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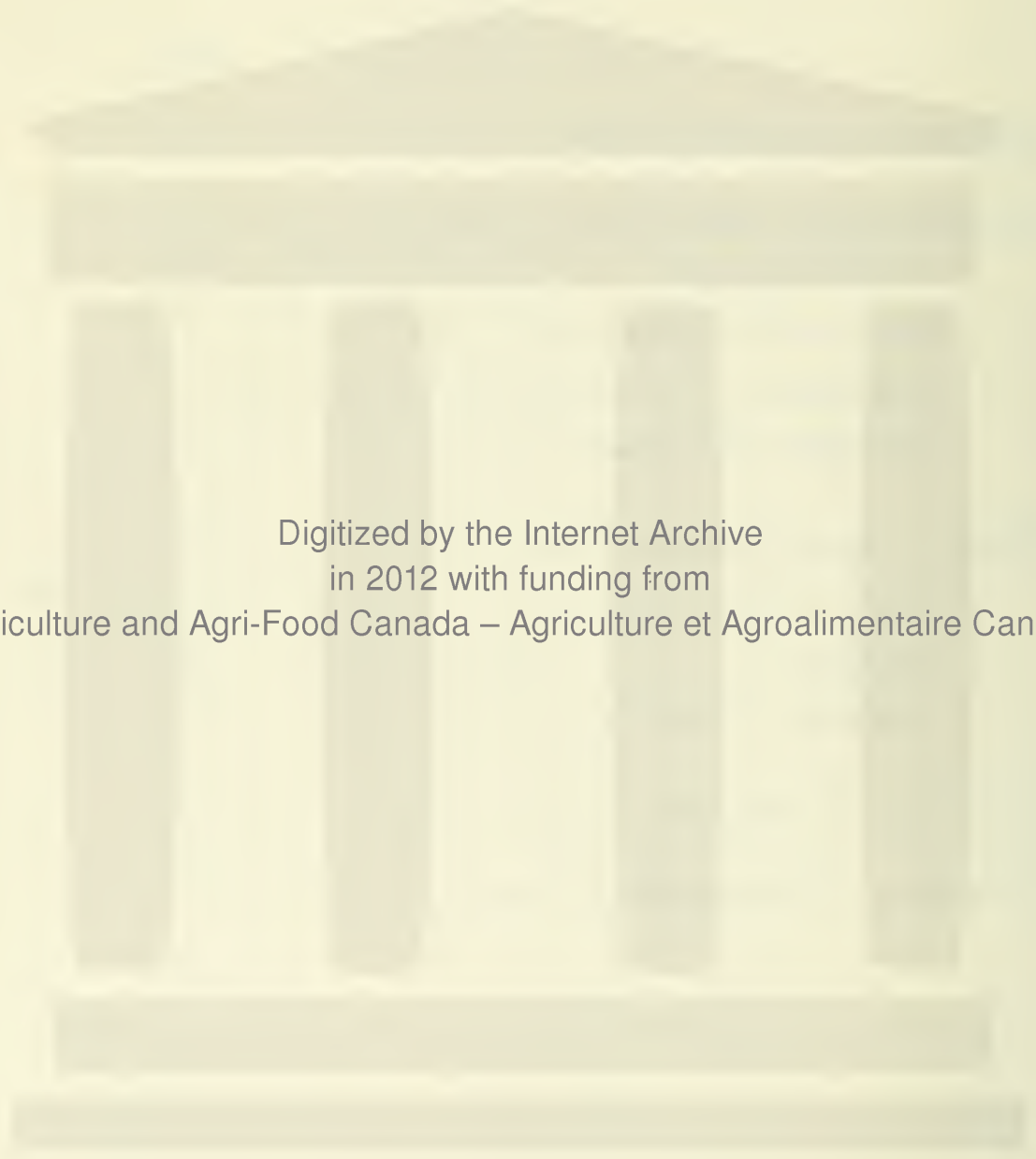


ROW SPACING AFFECTS YIELDS OF FORAGE GRASSES IN THE BROWN SOIL ZONE OF SASKATCHEWAN

M. R. Kilcher
Experimental Farm
Swift Current, Saskatchewan

Perennial grasses usually yield much less under the semi-arid conditions in the brown soil zone of the Canadian prairies than in prairie areas that have more moisture. Any management practice that increases the yields even a little is important.

Though grass-legume mixtures yield much better than forage grasses grown alone, many thousands of acres are still being seeded only with grass. If this practice continues, as is likely, the grasses should be managed so as to produce as much as possible under the existing conditions of soil and climate.

One of the most neglected practices in managing perennial grasses for forage is the use of suitable spaces between the seeded rows. From 1938 to 1959, tests on spacings between rows for four common forage grasses in the brown soil zone were conducted at the Experimental Farm, Swift Current. This publication gives the results of these tests. Various factors affecting the yields are discussed, as well as some practical limitations in choosing the most suitable spacing for each of the grasses.

GRASSES TESTED AND METHODS USED

Crested wheat grass, Russian wild rye grass, brome grass and intermediate wheat grass were the four species tested. Most of the tests lasted five years. To obtain results for different periods of years, all except intermediate wheat grass were included in more than one test. Yields of dry matter in each crop year, as well as general observations, were recorded.

Each crop was seeded in drilled rows. The spaces between rows varied from 6 to 36 inches with 6-inch increases. In all tests, 30 seeds were sown per linear foot of row. All plots were seeded in the spring on dry land loam in summer fallow.

YIELDS AND GENERAL OBSERVATIONS

For each grass, the relation of yield to distance between rows was consistent from test to test for comparable test years. The yields of each grass are therefore expressed in averages for the various years of production.

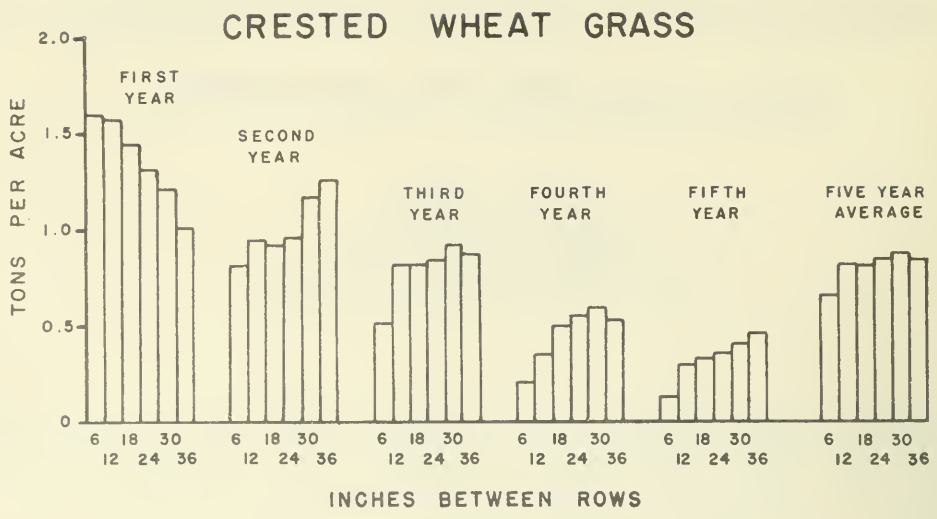
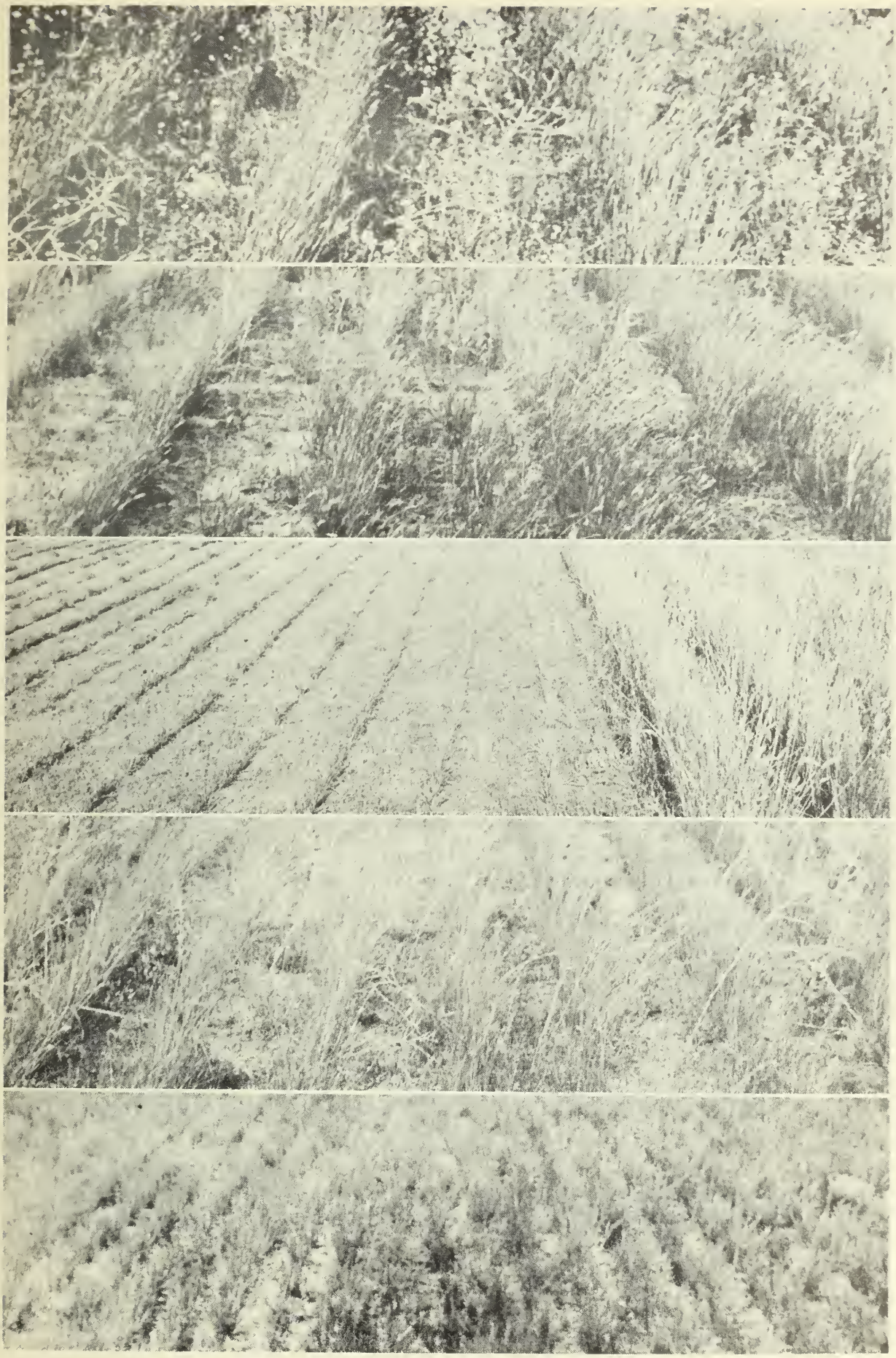


Figure 1.--Yields of dry matter per acre from crested wheat grass grown in rows seeded various distances apart, averages of four tests, 1938-42, 1941-45, 1944-48, 1954-59.

Crested wheat grass.--Except in the first crop year, crested wheat grass yielded more per acre in widely spaced rows than in rows 6 inches apart (Fig. 1). In the second year the stands with 12-inch spaces yielded 16 per cent more than those with 6 inches; in the fifth year they were 57 per cent more productive. For rows 18 and 24 inches apart the yields were similar to those for rows 12 inches apart. When rows were 30 or 36 inches apart, the yields were greater than for those 12 inches apart (Fig. 2). At these very wide spacings the amounts of stem growth and heading were increased. However, the crown growth of the plants, and some soil erosion between rows, soon caused undesirable ridging in the fields.

Russian wild rye grass.--The narrowly-spaced rows gave the lowest yields of Russian wild rye grass (Fig. 3). In the first crop year the yields per acre for rows 6 inches apart were 25 per cent less than for rows 12 inches apart, and 40 per cent less than for those 18 inches apart. Throughout the succeeding crop years the yields from the rows 6 and 12 inches apart were each less than for rows 18 inches apart. For all five years, the yields for rows 30 and 36 inches apart averaged slightly less than for those 18 inches apart. Practically no weeds grew between the rows even when they were wide apart. However, the exposed soil between the widely spaced rows eroded somewhat, and this accelerated the build-up of plant crowns in the rows.

Figure 2.--*(on page 7)* Bottom to top, crested wheat grass at 6-, 12-, 18-, 24-, and 30-inch spacings between rows. Increasing the space between rows results in more grass growth but also more weeds.



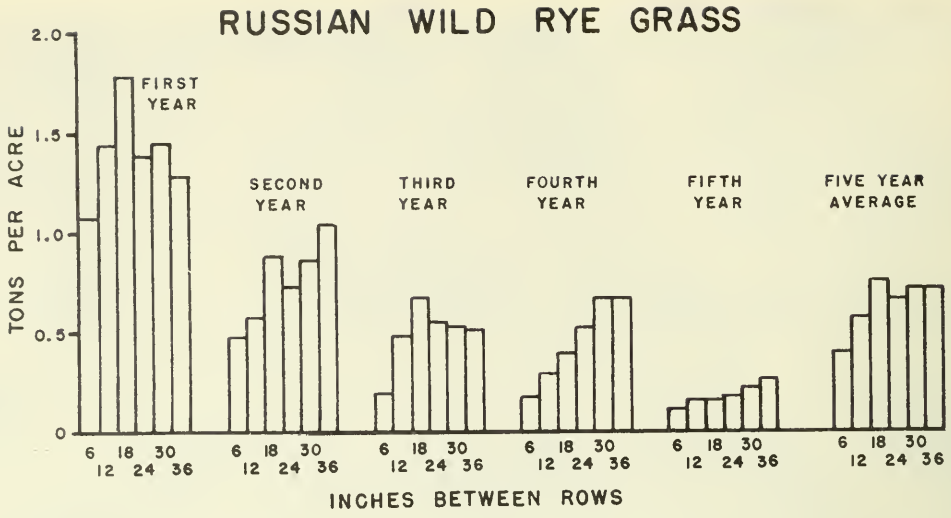


Figure 3.--Yields of dry matter per acre from Russian wild rye grass grown in rows seeded various distances apart, averages of two tests, 1950-54, 1953-57.

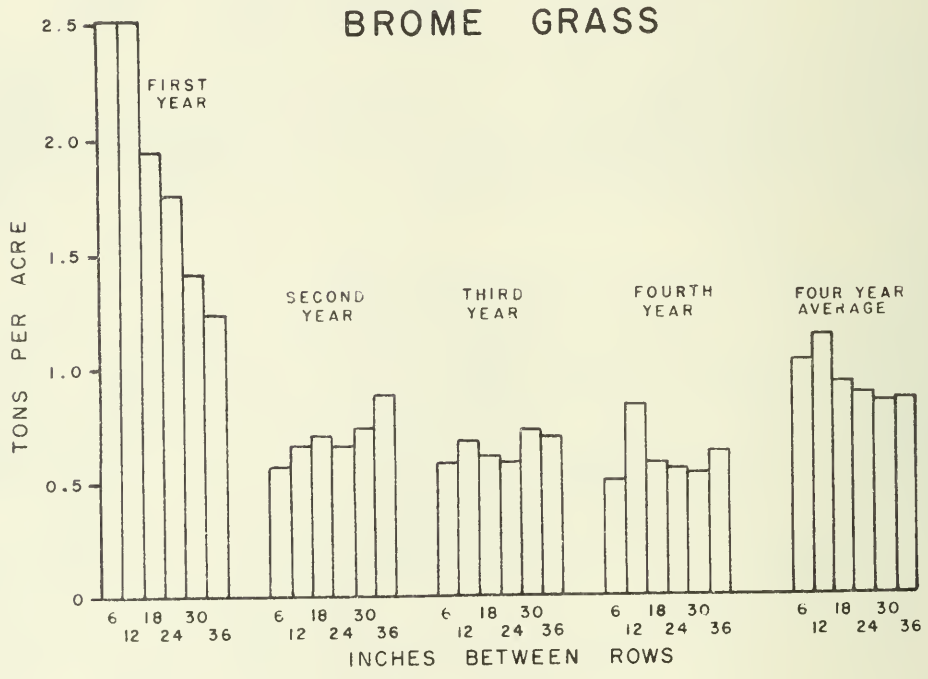


Figure 4.--Yields of dry matter per acre from brome grass grown in rows seeded various distances apart, averages of two tests, 1939-42, 1944-47.

Brome grass.——Brome grass showed little or no advantage from the wider row spacings (Fig. 4). In the first year the yields per acre were ½ ton to 1½ tons higher for rows 6 or 12 inches apart than for the others, and after the first year the annual yields were about the same. In the first year the yields were notably higher than in the later years; the difference in yield between rows 6 or 12 inches apart and those 24 inches apart nearly equalled the total yield of any of the plots in any of the next three years. The brome grass quickly filled in all the space between the rows.

Intermediate wheat grass.——In only the first and the second crop years were the yields of intermediate wheat grass as high in plots with rows 6 inches apart as in any of the others (Fig. 5). In the third to fifth years the yields from the 6-inch rows were 45 to 55 per cent lower than from rows 12 inches apart. Stands with rows over 12 inches apart were very weedy and yielded little more or less than those with rows 12 inches apart.

In the one test on intermediate wheat grass the yields were lower than those of the other three grasses. Usually this grass yields as much as the others, but the years of this test, 1954 to 1959, were very dry and poor for grass production.

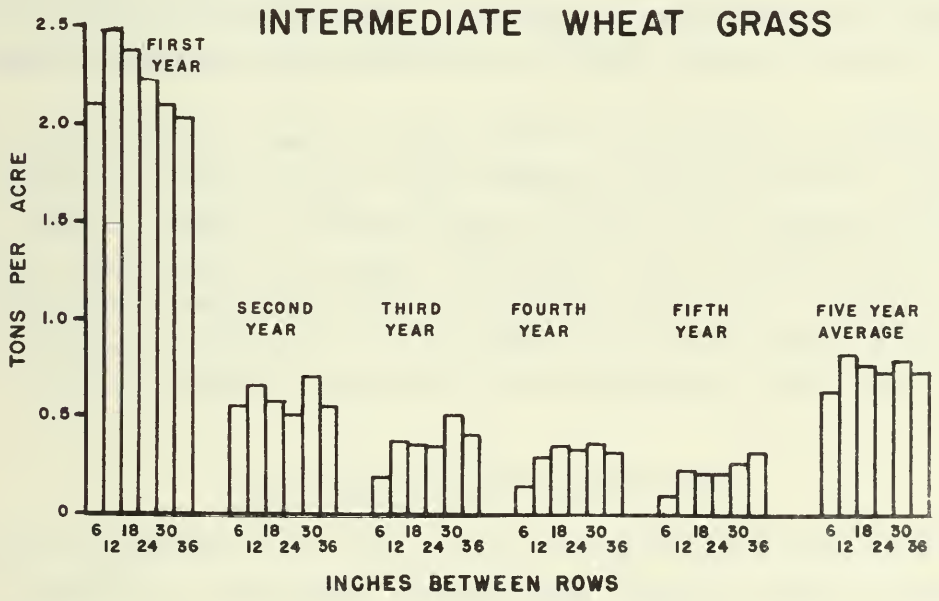


Figure 5.——Yields of dry matter per acre from intermediate wheat grass grown in rows seeded various distances apart, 1954-59.

EFFECTS OF VARIOUS FACTORS ON YIELDS

These tests showed that yields may vary considerably because of differences in the spaces between rows at seeding and the ages of the stands. Some of the major factors influencing yield are discussed below.

Characteristics of Species.——The grasses studied are influenced differently by the spacing between the rows because of differences in their characteristics and growing habits. Some of the grasses are 'bunch' types and others spread by means of underground shoots. The bunch grasses stay in rows but the others spread, filling in the spaces between the rows. Some of the grasses resume growth earlier in the spring than others and so use the soil moisture reserves more efficiently. Crested wheat grass and Russian wild rye grass, both bunch grasses, resume growth early.

Characteristics such as leaf size, height of plant and amount of stem affect the efficiency of a plant in its use of water. Some species, such as Russian wild rye grass, develop most of their leaves at the bases of the plants; others, such as brome grass, have most of their leaves higher on the stems. The decomposition and annual replacement of roots differ considerably between species, also.

Soil Moisture.——Because of the differences between the grasses, some need more water than others and the amount available for rows ideally spaced for one grass may not suit another. When few grass plants use a limited amount of soil moisture they grow larger and yield more than crowded plants. This helps to explain why grasses usually yield more in widely- than in narrowly-spaced rows.

Availability of Nutrients.——Grass plants require a continuous supply of nitrogen from the soil for good growth. Dense stands quickly deplete the soil of available nitrogen; the resulting stunted growth of grass is often called a 'sod-bound' stand. With thinner stands, the plants grow more rapidly and larger; the well-developed roots penetrate farther and have larger feeding zones than those in denser stands. Therefore, deficiency of nutrients, particularly nitrogen, is deferred longer when the stands have wide spaces between the rows.

SOME PRACTICAL LIMITATIONS

Yield is not the only thing to keep in mind when selecting the best space to use between rows of grass. Some practical limitations to planting in widely spaced rows are: unsuitability in a short rotation, soil erosion, encouragement of weeds, less intense use of land, and undesirable 'washboarding' or ridging of the field.

If the stand is kept for only one or two seasons, the advantages of wide spaces between rows are not so great as they would be with a longer rotation. For example, a field to be seeded as spring pasture for a very short grazing

season, or as a holding field to be heavily stocked, might best be seeded in narrowly-spaced rows to withstand excessive tramping.

Plants in widely-spaced rows often build up at the crowns, causing elevated rows that are extremely difficult, if not impossible, to cut and rake for hay.

Because of these disadvantages spaces greater than 24 inches between rows are not generally recommended for these forage grasses.

CONCLUSIONS AND RECOMMENDATIONS

Large yields in the first crop year, though significant, are usually not the most important consideration in assessing the growth and value of a perennial grass crop, especially one used in a long-term rotation.

Grasses grown in rows 12 or 18 inches apart usually yield about ½ ton per acre annually in the brown soil zone of the prairies. Grown in rows 6 inches apart, they usually yield much less.

For forage production in the brown soil zone, the recommended distances apart to seed rows of the four grasses tested at Swift Current are:

Crested wheat grass: not less than 12 and no more than 18 inches.

Russian wild rye grass: 18 inches.

Brome grass: 12 inches.

Intermediate wheat grass: 12 inches.

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