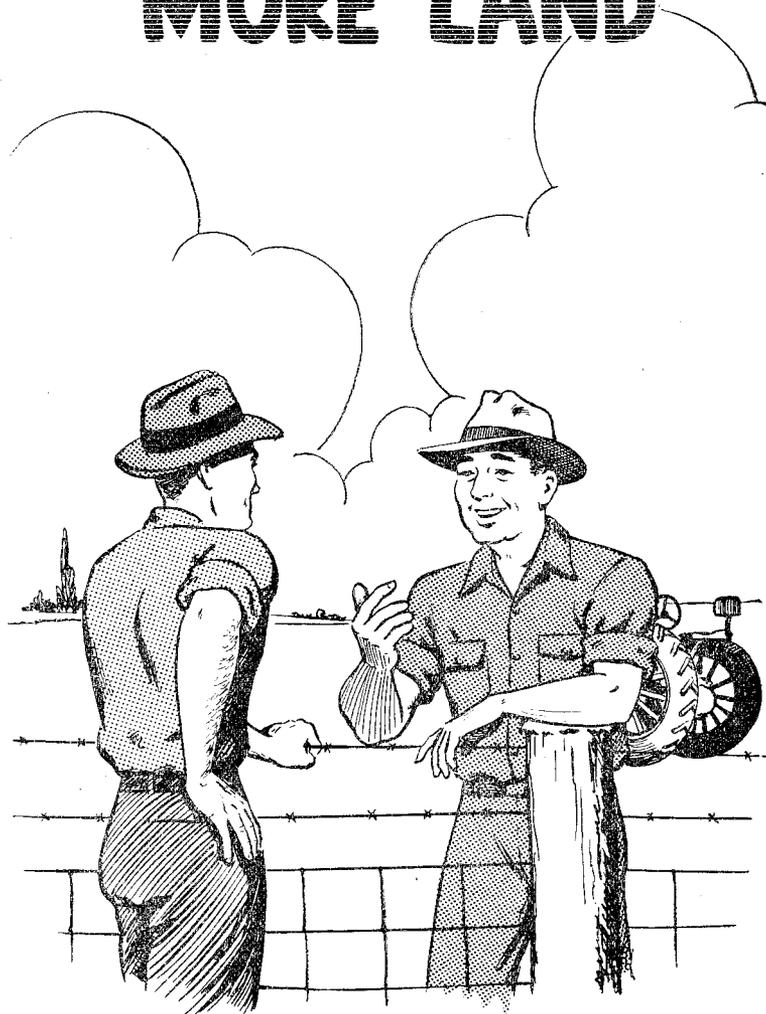


GOOD ROTATIONS

are like

MORE LAND



Your Red River Neighbor
Tells About Legumes

S. A. ENGENE and A. VANVIG

UNIVERSITY OF MINNESOTA
Agricultural Extension Service
U. S. DEPARTMENT OF AGRICULTURE

Good Rotations are like More Land

S. A. Engene and A. Vanvig

Art and Clarence Sundstrom of Wolverton showed us an interesting field of oats last spring. It was good oats, but the west part was taller and darker than the rest.

"That," said Art, "is where we plowed up an alfalfa field last year."

Many farmers in the Red River Valley have told us the same thing. After alfalfa, they have had better yields, the land has dried out more quickly in the spring, and it has been easier to work.

You may have seen differences from alfalfa on your farm. You may also have figured how much it has increased the yield per acre of the following crops. But, have you ever figured how much that difference could make on the entire farm? We had a chance to do that, along with a group of farmers, last winter. The results were so startling that we believe every farmer interested in his present income and the future of his land will want to study very carefully the figures we worked out.

Rotations in the Red River Valley

During the fall and winter of 1949, we talked at meetings with 125 farmers in six of the Red River Valley counties. All were experienced farmers and shrewd observers. To shorten our discussion, we'd like to tell you about our findings for heavy soils only, although the farmers represented both heavy and light soils.

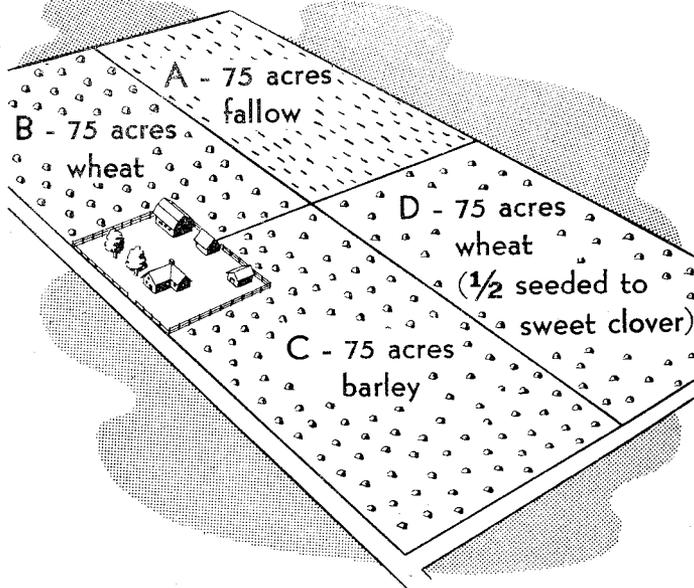
We asked those farmers, "What crop rotations would you suggest for the Red River Valley?"

Their first suggestion was a four-year rotation—one year of fallow and three years of grain. They said that at least half of the fallow should be sweet clover fallow; the sweet clover should be seeded with the previous grain crop, plowed under the next spring, and the land kept black the rest of the year. The crop arrangement on a farm would look like this:

	Field A	Field B	Field C	Field D
1951	Fallow	Wheat	Barley	Wheat
1952	Wheat	Fallow	Wheat	Barley
1953	Barley	Wheat	Fallow	Wheat
1954	Wheat	Barley	Wheat	Fallow

Only wheat and barley are shown here. In practice, oats, flax, or other crops would be used in place of part of the acreage of the wheat and barley.

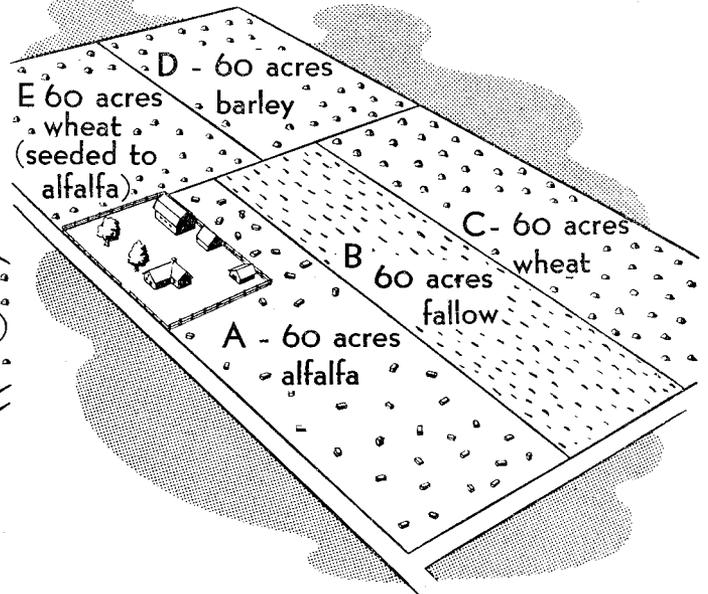
FOUR-YEAR ROTATION



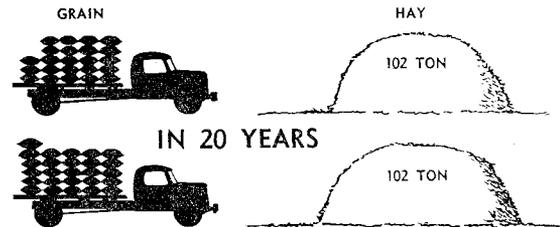
THIS YEAR



FIVE-YEAR ROTATION



THIS YEAR



HERE'S A BIRD'S-EYE VIEW of how your rotations will work. Grain yields for the four-year rotation this year will be 4,950 bushels; in 20 years, 4,455 bushels. Grain yields for the five-year rotation this year will be 4,680 bushels; in 20 years, 5,148 bushels.

The farmers also suggested a five-year rotation—one year of alfalfa, one year of fallow, and three years of grain. The alfalfa would be seeded with grain. The following year, alfalfa hay or seed could be harvested, or it could be clipped and left on the land. The alfalfa would be plowed under the following spring and fallowed for the rest of the year.

Alfalfa Increases Yields

We asked the farmers what yields they would expect to get from these rotations. They discussed their own experiences and those of their neighbors very carefully. They did not agree fully, but set down these figures as their estimates for the four-year rotation:

- First year—fallow—no yield
- Second year—wheat—23 bushels per acre
- Third year—barley—28 bushels per acre
- Fourth year—wheat—15 bushels per acre

This rotation is close to what many farmers are doing now on the heavy soils of the Valley. These yields are about what farmers in the Valley have been getting in the last ten years. For the five-year rotation, they made the following estimates:

- First year—alfalfa—1.7 tons per acre
- Second year—fallow—no yield
- Third year—wheat—26½ bushels per acre
- Fourth year—barley—33 bushels per acre
- Fifth year—wheat—18½ bushels per acre

The estimates of these experienced farmers show a fairly large increase in yields following alfalfa. Soils men and agronomists say that they do not have enough experimental work to give definite answers, but most of them agree that these estimated increases check reasonably well with their observations. Much more of the land is used for legumes in the second rotation.

Production on a Half-Section Farm

Now we come to our most important point. Let us see what these yield differences would mean if these rotations were used on an entire farm. Take a half-section farm with 300 acres of tillable land. With the four-year rotation, the farmer would have 75 acres of fallow, 75 acres of wheat on land following fallow, 75 acres of barley, and 75 of wheat on land which was fallowed three years earlier. Multiplying by the yields shown above, he would get:

Wheat	75 acres x 23 =	1,725 bushels
Barley	75 acres x 28 =	2,100 bushels
Wheat	75 acres x 15 =	1,125 bushels
Total grain		4,950 bushels

With the five-year rotation, the farmer would have five fields, each with 60 acres. Multiplying by the yields above, this gives:

Wheat	60 acres x 26½ =	1,590 bushels
Barley	60 acres x 33 =	1,980 bushels
Wheat	60 acres x 18½ =	1,110 bushels
Total grain		4,680 bushels
Alfalfa	60 acres x 1.7 =	102 tons

Look at these figures again. With the first rotation, 225 acres of grain would give 4,950 bushels of grain. With the second rotation, 180 acres would give 4,680 bushels. That is only 270 bushels less grain. That is not a very large difference. To offset the loss of grain, the second rotation would give 60 acres of alfalfa that could be used for hay or seed.

Now, look at the expense side. With the second rotation the farmer would have 45 acres less grain than with the first. He would save the seed and labor for that grain. He would have 15 acres less to fallow. He would, however, have to buy more legume seed, and he would have the 60 acres of alfalfa to care for.

Let's Look Ahead

For the many farmers who are looking 10 years, 20 years, or even longer into the future, the effect of legumes is even greater. We asked the farmers at our meetings, "If you used these rotations for the next 20 years, what would happen to your yields?" Their estimates varied; most of them had not seen any alfalfa rotation run that long. Their estimates, however, fitted into a pattern. They thought that the first rotation would cut yields about 10 per cent in 20 years. They said the second rotation would improve the land to give 10 per cent higher yields in 20 years. Alfalfa would improve soil structure and drainage and add more organic matter to the soil.

Total production in 20 years then would be:

With the four-year rotation (with no alfalfa)—4,455 bushels of grain

With the five-year rotation (which includes alfalfa)—5,148 bushels of grain and 102 tons of hay

This deserves close study. In 20 years, alfalfa will improve the land enough so that 180 acres of land will give more grain than 225 did before. The farmer will have more to sell even if he uses his alfalfa only to improve soil. Even if we cut these long-time benefits in half, the five-year rotation looks good.

The yields given above are what the farmers would expect if they continued to use only small amounts of commercial fertilizers, as in the past. Much more probably will be used. Soils men and agronomists say fertilizers will give bigger yield increases with alfalfa than sweet clover rotation.

Maybe we should reverse our thinking about alfalfa. We usually think of alfalfa first as a feed crop and second for soil improvement. The figures given by these farmers suggest that its fertility value may be more important than its feed value.

Adjust the Estimates to Your Farm

Judging by these estimates, each farmer can well afford to study his cropping system carefully. Do you agree with the yield estimates these farmers made? Maybe you think they were too optimistic or too pessimistic. Maybe your land is different. If so, write down your estimate. Then calculate the production for your farm, as we have done here.

You may also want to consider other rotations—rotations that may fit your farm better than the two we have discussed. For example, you may want to change the five-year to a ten-year rotation. To do so, leave the alfalfa for two years, plow it and fallow it in the third year, raise grains for three years, fallow the next year, then raise grain for three more years. By leaving the alfalfa down for two years, you can profitably add some fibrous-rooted crop.

The addition of alfalfa to the rotation adds some problems, however. How shall the alfalfa be used? There are several possibilities. You can cut it for hay and then feed it on the farm. For many farmers, that will mean adding or increasing livestock. Some farmers can cut and sell hay. That, of course, will mean selling some fertility—the land will not be improved as effectively. Some may be able to harvest seed; others may cut alfalfa and leave it for soil improvement.

UNIVERSITY FARM, ST. PAUL 1, MINNESOTA
Cooperative Extension Work in Agriculture and Home Economics, University of Minnesota, Agricultural Extension Division and United States Department of Agriculture cooperating, Paul E. Miller, Director. Published in furtherance of Agricultural Extension Acts of May 8 and June 30, 1914.
7500-12-50