Willamette Valley
PASTURES

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FRONT COVER—Subdivision of fields, forcing cattle to eat all of the grass in each in a short time, is one kind of pasture management that pays if accompanied by fertilization, mowing, and the use of high-yielding grasses and legumes. This type of management works particularly well on irrigated pastures.
A Willamette Valley farm in the foothills of the Coast Range. Pasture and hay crops on bottom lands, and cut-over timber land on the adjacent hills used for pasture. (See Hill-land Pastures, page 16.)
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FOR AT LEAST FOUR REASONS, the number of livestock in Oregon is likely to increase during the next twenty-five years:

- The growing population of the West Coast demands more meat, more milk, and more milk products.
- At one time Oregon shipped much of its meat to the East. Now West Coast markets absorb locally produced meats and reach as far east as Omaha for supplies. Thus Oregon producers receive more than Midwestern growers for meat animals of a comparable grade.
- New forage crops and new irrigating and fertilizing practices enable Oregon farmers to produce far more milk or meat per acre than was possible ten years ago.
- Soil conservation demands more land in grass.

IF THE ABOVE REASONING IS SOUND, the state must have more pasture and better pastures because:

- Pasture can be harvested with less labor than other crops and labor costs are probably on a permanently high level.
- Of the four feeds—pasture, hay, silage, and grain—pasture is far the cheapest. The cost of a pound of digestible nutrients from pasture is usually not over half the cost of hay or silage and about one-fourth the cost of grains.
- Pasture makes less call upon machinery and equipment.
- Pasture offers great opportunity for improvement. Many Willamette Valley farmers, for example, have pushed crop yields nearly as high as they possibly can, while their hillland pastures produce very little.
- Although protein feeds are nearly always high in price, good pastures are high in protein and low in cost.
- Pastures build and save soil, increasing the yield of succeeding crops.
- Pastures are the best of all crops for soil conservation.

THIS BULLETIN GIVES SOME PASTURE FACTS that can help many farmers reduce costs of livestock production. For other farmers it can point the way to larger livestock numbers without buying more land. Livestock numbers are flexible, but acres of land are fixed and permanent. A farmer wants high production per acre. An increase of forage production per acre usually enables the operator to carry more livestock at a lower cost.
To Improve Your Pastures

- Choose the right legume . . .
  *Subterranean clover* is the real hope for a hill-land legume.
  *Red and alsike clover* can be used for all-summer pastures if not cut for hay. *Ryegrass* seeded into these clovers the second year will produce another year of cheap pasture.
  *Sweet clover*, in a first- and second-year combination, makes possible all-summer green feed.
  *Crimson clover* spring-seeded is ideal for winter feed.
  *Ladino clover* is useful only on irrigated or naturally moist lands but is superlative there. It needs phosphate regularly.
  *Lotus* is excellent for moist or wet lands.
  *Alfalfa* outyields other legumes but will not grow on all soils.

- Choose the right grasses . . .
  Willamette Valley farmers have many good grasses to choose from, each of them adapted to certain conditions.
  Uncultivated hill lands, plow lands, and low, wet lands all require different mixtures of pasture grasses.

- Choose the right fertilizer . . .
  Legumes need phosphorus and sulphur.
  Grasses need nitrogen.
  *Nitrogen fertilisers* (barnyard manure, for example) will step up pasture yields, especially when supplemented with phosphate.

- Irrigate if feasible . . .
  Some Willamette Valley irrigated pastures are among the highest yielding in the nation.
  Use sprinklers for rough land or when water supply is limited.
  Use surface methods for gently sloping lands.
  The best irrigated pastures are yielding the equivalent of up to eleven tons of hay per acre.

- Plan a year-round pasture system . . .
  *Abruzzi* or giant *winter rye*, *crimson clover*, *vetch*, *permanent grasses*, *sweet clover*, *alfalfa*, *red clover*, and *subterranean clover* can be so planned as to make pasture available for 12 months in most years.

- Apply the known principles of pasture management . . .
  Nineteen principles are given on pages 35-39.
The Right Legume

The first and most important thing in pasture improvement is to find the right legume. Grass yields are determined by the amount of available nitrogen in the soil, and nitrogen can be added to pasture soils only by spreading manure or commercial fertilizer or by growing a legume. Legumes are usually the cheapest of the three. Several excellent legumes are available to western Oregon farmers.

Subterranean Clover

Subterranean clover, widely used in Australia, takes its name from its curious habit of burying its seed as soon as formed. "Sub" clover fulfills a long-standing hope of the heartsick grazer of western Oregon. It grows on acid soil; it produces far beyond the somewhat feeble attempts of the hop clover; it reseeds itself; and it stimulates the grass amazingly. Seeding can be done in the early fall along with adapted grasses, though late spring is a better planting time. At least five pounds of clover should be used to the acre. Seed should be inoculated, and the seedbed must be firm. There are several strains of subclover. Early strains should be used on soils low in organic matter; midseason strains should be used on the better soils. For most southern Willamette Valley sites the Mt. Barker strain is excellent—or the even better, newer strain, Nangeela. On the better soils and in the northern end of the valley, the Tallarook strain is higher yielding than Mt. Barker, but probably no better than Nangeela. Australian results indicate that, as with Ladino, subclover is nearly always helped by phosphate fertilizer.

It is safest to seed subclover in the late spring. Fall seedings often produce very little winter feed the first year and they frequently winterkill; whereas the spring seedings nearly always live. For spring seeding, work the ground to a firm seedbed, seed 5 to 6 pounds per acre alone, and seed the grass into the clover in the fall. If one is raising seed, a good pasture stand can be obtained by top-dressing a field with straw after threshing. Subterranean clover is suitable for most Willamette Valley soils, but it will not grow on the flatter, wetter lands.

Subclover and alta fescue, properly fertilized, make a combination that has revolutionized the pasture thinking of hundreds of western Oregon farmers. Hillsides regarded as nearly worthless
Dr. A. A. Johnson of Cornell University inspecting a Ladino clover field in southern Oregon.

are turning out amazing quantities of feed. Subclover is the most important single forage find of the century for western Oregon.

Red and Alsike Clover

Red clover is used mainly on the more productive and better-drained soils; alsike is used on the flatter fields lacking drainage. Both are short-lived but furnish cheap, abundant feed and fertilize the grasses seeded with them. This fertilizing effect lasts for at least two years after the clover dies. Thus a grass mixture including these clovers will be higher yielding for at least four years than will the same grasses seeded without the clover. Where these clovers are grown for seed or hay, a splendid follow-up is to seed common ryegrass into them the second fall when the clover stands are becoming thin. The dead clover roots fertilize the grass, a plowing is saved, and one year of high-yielding pasture is obtained with very little cost.

On soils that do not hold moisture well, the clovers should be seeded alone in the late spring after the land has been worked down to a firm seedbed and the weeds have been destroyed. If used solely for pasture the second year, and no hay crop is cut, the growth can
WILLAMETTE VALLEY PASTURES

be kept green nearly all summer by keeping the crop pastured down. If a hay crop is cut, there may not be much pasture afterward, depending upon rainfall. Strictly as a pasture crop the clover is cheaper per ton and more productive than Sudan grass, is of more benefit to the soil, and should be used more. Clovers should be seeded with grass. Alta fescue, orchardgrass, Tualatin oat, meadow foxtail, perennial ryegrass, and common ryegrass all go well with them. Red clover, if seeded alone, should be seeded at the rate of 12 pounds per acre. Seed 6 pounds of alsike. If grass is seeded with them, use 15 pounds of the grasses mentioned above and 8 pounds of red clover or 4 pounds of alsike. For best results with clover, landplaster is needed on nearly all lands at the yearly rate of at least 100 pounds per acre. Phosphate is profitable on many soils. Some fields will not grow clover without lime.

Willamette Sweet Clover

This is a biennial clover and should be seeded at the rate of 15 pounds per acre. It will grow only where alfalfa thrives, but it has some advantages over alfalfa for pasture. One can get summer-long pasture from it by using a combination of first- and second-year sweet clover. A good method is to seed in February into fall-seeded wheat or rye. Pasture the grain heavily in the spring to prevent seed formation. After the grain dies, the clover will make late summer pasture and in the early part of the following year it will make nearly as much feed as will an irrigated field. Another good method is to seed in the spring with common ryegrass. This makes more feed the first year than the sweet clover alone and it reduces bloat hazard—although bloat from sweet clover is not so common as from alfalfa or red clover. The most common method is to seed alone in the spring. By seeding a field each year in the spring, one can have summer-long green feed. From April to August one can pasture the second-year sweet clover, and from August to October he can pasture the first-year crop.

Crimson Clover

This is a crop that merits wide use in western Oregon. It grows in cooler weather than red, alsike, or sweet clover and thereby furnishes pasture at a time when most of the legumes are tucked in for the winter. When spring-seeded, it has the comfortable habit of

**Clover, if kept fed down, is cheaper summer feed than Sudan grass.**

**Sweet clover works all year long.**

Sheep on fescue and subclover pasture.

making feed when it is needed most—late summer and in open winters. Methods of seeding include:

1. Late April or May seeding with common ryegrass. Rate—15 pounds of crimson clover, 10 pounds of ryegrass per acre.
2. Spring seeding with rape. Rate—15 pounds of crimson clover, 6 pounds of rape.
3. May or June seeding alone, using 20 pounds of seed.
4. May or June seeding, clover alone, then drilling in ryegrass in September. Rate—15 pounds of clover, 15 pounds of ryegrass.
5. September seeding alone. Rate—20 pounds of seed.
6. September seeding with either rye or ryegrass. Rate—15 pounds of crimson clover and 15 pounds of ryegrass, or 30 pounds of rye.
7. Top-dress the land with crimson clover straw after threshing. (Adapted to small fields, orchards, or unplowed areas.)

The only disadvantage to this legume is that its trick of growing in cool weather betrays it in the advent of really cold weather. A
sudden drop to below zero weather catches it unprepared—without its winter underwear. September seedings furnish very little winter pasture and no fall pasture. May and June seedings supply the valuable fall and winter feed.

Some dairymen report that one acre of crimson clover pasture has replaced two acres of vetch hay formerly needed for winter and spring feed—a good way to increase, in effect, the size of the farm without buying more land. Crimson clover grows on land too acid or with subsoils too tight for alfalfa and furnishes pasture until late in June. It is a winter annual, like winter wheat, but if it goes to seed, it volunteers readily and some dairymen have pasture for three or four years with only one seeding. Seed should be inoculated. Phosphate fertilizer is needed on the hill soils.

Crimson clover cuts winter hay bills.

Ladino and White Clover

These clovers are commonly grown in the Willamette Valley with irrigation only, although white clover volunteers along creeks. A new strain of white clover, Kentish wild white, is more persistent than most other strains of white and is better adapted to western Oregon. Seedings on irrigated land for pasture should be made only with grass. Of all the grasses, probably meadow foxtail is most ideal because of its season-long growth, its high palatability, its ability to stand overirrigation, and its earliness. Other well-adapted grasses are orchardgrass, alta fescue, Tualatin oat, and perennial ryegrass. Alta fescue and Ladino together produce the highest-yielding combination. Seed on a well-packed seedbed in spring or in late August on irrigated land. Late fall seedings of Ladino often winterkill.

Some good mixtures are:

1. Alta fescue ......................................................... 15 pounds
   Ladino clover .................................................... 3 pounds
2. Ladino clover ..................................................... 3 pounds
   Meadow foxtail .................................................. 8 pounds
3. Ladino clover ..................................................... 3 pounds
   Perennial ryegrass ............................................. 18 pounds
4. Ladino clover ..................................................... 3 pounds
   Perennial ryegrass ............................................. 5 pounds
   Alta fescue ...................................................... 6 pounds
   Orchardgrass .................................................... 6 pounds

The superior production of Ladino clover comes from the long runners that spread in every direction and send up leaves at short
intervals their entire length. These runners have rather short roots, and if soil moisture is lacking so that these roots are in dry soil, the runners may die. Naturally, in this case, the clover produces very little feed. These runners are not only the strength of the plant but also its weakness. They are fleshy and succulent, and livestock of all kinds will eat them with relish, if leaf growth is short. Thus, close pasturing that would not harm irrigated grass may result in reducing Ladino yields to the level of common white clover. Ladino pasture, therefore, should be rotated. On the experimental pastures at Corvallis,* yields with various rotation periods were as follows:

YIELD PER ACRE OF LADINO CLOVER CUT AT INTERVALS OF ONE TO SEVEN WEEKS—1939

<table>
<thead>
<tr>
<th>State of growth</th>
<th>Green forage Tons</th>
<th>Alfalfa hay per acre necessary to produce the same amount of feed Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>10.7</td>
<td>2.73</td>
</tr>
<tr>
<td>2</td>
<td>17.0</td>
<td>3.81</td>
</tr>
<tr>
<td>3</td>
<td>21.0</td>
<td>4.24</td>
</tr>
<tr>
<td>4</td>
<td>24.4</td>
<td>5.28</td>
</tr>
<tr>
<td>5</td>
<td>26.7</td>
<td>5.16</td>
</tr>
<tr>
<td>6</td>
<td>22.7</td>
<td>4.86</td>
</tr>
<tr>
<td>7</td>
<td>22.8</td>
<td>4.92</td>
</tr>
</tbody>
</table>

Rotating every three weeks, while not quite so high yielding as the four-week intervals, was judged the most practicable. The four-week interval was difficult to work out because of wasted feed.

Irrigated Ladino clover pastures need plenty of water if they are to produce according to their reputation. Many western Oregon farmers depend too much upon spring rains during May and June and not enough upon their irrigation equipment. Irrigation should start early and continue through the season. If the pasture ever slows down because of lack of moisture, it is impossible to bring it back to a high-producing plane again that year.

The runners are responsible for another weakness. Their roots, as mentioned, are shallow. These roots gather a tremendous amount of plant food during the year and much of it comes from the top

three inches of soil. Much of the available phosphorus is usually used within two years and from then on yields can be sustained only by adding at least 150 pounds of treble phosphate or 300 pounds of superphosphate every year. Experienced Ladino growers use both landplaster and phosphorus as regularly as they pay taxes or set the hens. Nitrogen applications in February or March and in the late summer or early fall will make much cheap feed. (See page 23.) The rank, tangled mat of Ladino is welcomed by slugs as well as by dairy cows. These disreputable pests may ruin a stand unless controlled.*

Lotus

A legume new to western Oregon is Lotus. The first extensive acreage in Oregon was in Jackson County, where it thrives on irrigated or partially irrigated land. Since it grows on land too wet for alfalfa, it would seem to be well adapted to some Willamette Valley heavy soils where alfalfa will not grow. Because seed is small—nearly as small as alsike—seeding rates can be rather low. Lotus withstands pasturing very well and can also be used as a hay crop. Plants that can be cut for hay or used as pasture at will are very few—the two uses are almost as antagonistic as race and draft requirements in one horse.

Mixed Lotus major and grass, Clackamas County. Lotus major is high yielding and will persist on wet and acid soils.

* See County Extension Agents for information on slug control.
Lotus is a perennial. There are two types, Lotus corniculatus and Lotus major.* The former has a root much like that of red clover; the Lotus major has an aggressive, spreading root system. The corniculatus is best for ordinary soils; the major is best for very wet lands or those that overflow in the winter. Seed early in the spring. The seed must be inoculated.

There are numerous strains of both of the Lotuses. Dozens of them are on trial at the Oregon Experiment Station. Two strains of Lotus major are in wide use in the Coast counties. In the Willamette Valley it is likely that Lotus corniculatus will find a wider field of use than Lotus major. The Empire strain of Lotus corniculatus is in use in the Atlantic Coast states and is grown for seed in Oregon but is not too well adapted to western Oregon. The Hoover strain from Jackson County is a somewhat prostrate, narrow-leaved strain of great value to California because of its alkali tolerance. It is a low producer in the Willamette Valley. A new strain grown at the Experiment Station seems to be far better adapted to the acid soils of western Oregon.

Alfalfa

Of all the legumes, alfalfa is the highest yielding, but it is adapted only to the best lands. It can be grown only on deep, well-drained soil. For those who can grow it, alfalfa furnishes more tons of nutritious feed than any other nonirrigated pasture plant in western Oregon. The cost per ton is also low. It also makes green feed through July and August when the cream check may sicken without it. With its long roots, it draws water from deep down in the subsoil and so is more or less independent of dry seasons. Thus the crop has everything needed in a pasture—nutrition, high yield, long season of growth, green feed in midsummer, dependable growth irrespective of weather, and cheapness. Why then isn’t it used more?

There are three main drawbacks: (1) The alfalfa is often hazardous to cattle and sheep because of bloat; (2) continued pasturing tends to kill alfalfa; (3) many lands will not grow alfalfa.

Bloat may be avoided in part by the following precautions:

- Seed grass with alfalfa. There are numerous good grasses. Orchard, Tualatin oat, and perennial ryegrass are all good; or a mixture of any of them can be used, seeding about 8 pounds of alfalfa and 15 pounds of grass per acre.

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If grass is not seeded with alfalfa, allow the alfalfa to come into full blossom before pasturing.

Avoid turning animals in when they are extremely hungry.

Cut a few mower swaths through the alfalfa and leave the cut material on the ground. The animals usually eat enough of this wilting and dry growth to slow down their consumption of green feed.

With some growers bloat is not much of a problem, but they dislike to kill their alfalfa by pasturing. The danger of killing the stand by pasturing may be overcome in part by the following methods:

- Divide the field into three or more pastures and allow each part to come well into bloom and cut for hay once at some time during the season.
- Change the sequence the following year. Pasture field A first this year, but next year allow field A to grow a hay crop in the early spring.
- Do not pasture when the ground is very wet.
- Allow the field to grow in September and early October. (This fall growth is very important to the life of the plant.)
- Seed grass with the alfalfa to prevent trampling damage and injurious close grazing.

Yearly applications of landplaster are needed for alfalfa on nearly all Willamette Valley soils. If the field is high-yielding, 200 pounds per acre are needed, otherwise 100 to 125 pounds. Yearly applications of phosphorus may or may not be necessary. One should experiment with phosphorus on every field. Boron in small amounts (30 pounds borax per acre) is needed on many of the western Oregon alfalfa soils. Lime at the rate of one or two tons per acre or more applied any time in advance of seeding may make for good alfalfa on acid soils. Alfalfa will not stand wet feet. On poorly drained soils with a high water table in winter, use one of the other legumes.
WE ARE BETTER SUPPLIED WITH GRASSES THAN WITH LEGUMES in that we have several suitable grasses for every condition. In the following discussion hill lands, plow lands, and wet lands will be treated separately.

Hill Lands

There are roughly one million acres of hill lands surrounding the Willamette Valley. Some were once plowed and later allowed to go back to native growth. Some were logged and burned over, but never plowed. The chief defect of these pastures is that the main production is in the spring. This can be overcome in part by using better grasses, better legumes, and using commercial nitrogen fertilizers on them. The use of commercial fertilizers on moss, weeds, and rattail fescue is questionable. Seed good grasses first, then fertilize.
Some suitable mixtures for hill lands are:

<table>
<thead>
<tr>
<th>Mixture</th>
<th>Rate per acre</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creeping red fescue</td>
<td>2 pounds</td>
<td></td>
</tr>
<tr>
<td>Orchardgrass</td>
<td>6 pounds</td>
<td></td>
</tr>
<tr>
<td>Alta fescue</td>
<td>8 pounds</td>
<td></td>
</tr>
<tr>
<td>Subterranean clover</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>Highland bentgrass</td>
<td>1 pound</td>
<td>Not palatable for</td>
</tr>
<tr>
<td>Chewings fescue</td>
<td>8 pounds</td>
<td>dairy cows.</td>
</tr>
<tr>
<td>Tualatin oatgrass</td>
<td>8 pounds</td>
<td></td>
</tr>
<tr>
<td>Subterranean clover</td>
<td>5 pounds</td>
<td></td>
</tr>
</tbody>
</table>

Plow Lands

On good plow lands pastures must compete with grain, hay, and seed crops, and many men question the advisability of putting high-producing land into grass pastures. With annual crops on good land there is usually an annual expense of at least $30 per acre. With good pastures this figure is usually not over $10. The pasture, therefore, does not need to return so many dollars as one must get from grain. In addition, feed from pastures requires far less labor than harvested crops require. Many steep, eroding lands should go down to grass right away and many grained-out farms would do well with a breathing spell of grass.
Here are a few rules for seeding grass on plow lands:

- Seed on a firm seedbed. This is more important than all the following seven rules put together.
- Use a corrugated roller for seeding. The best implement of all is a double corrugated roller with drill box attached. A drill with a grass seed attachment is the next best. Broadcasting and harrowing are seldom so satisfactory.
- Cover the seed only half an inch or less.
- Seed alone. A nurse crop helps to keep down weeds, but it often keeps down nearly all the grass.
- Seed early in the fall. If one cannot get to it until the first of November, it is better to wait until spring.
- Use simple mixtures of adapted varieties. The grasses used should be adapted not only to the climate, but to the soil and to the class of livestock. A good grass on one soil may be poor on another. The one best grass and the best legume to go with it will usually be higher yielding than a more complicated mixture. (Example—alta fescue and subclover.)
- Use common ryegrass sparingly in the mixture—not over 3 or 4 pounds per acre. Do not use it at all unless necessary to check erosion. On steep land its quick growth prevents erosion. It grows so much faster than do other grasses that the effect is the same as though a grain nurse crop were used.
- Fertilize with nitrogen at seeding time. Use at least 30 pounds of nitrogen (150 pounds ammonium sulphate per acre); on poor soils use more.

Below are some good grass mixtures for various soil types:

FOR UPLANDS OF MEDIUM PRODUCTIVITY (AIKEN, MELBOURNE, OR OLYMPIC SOILS).

<table>
<thead>
<tr>
<th>Mixture</th>
<th>Rate per acre</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Alta fescue</td>
<td>15 pounds</td>
<td></td>
</tr>
<tr>
<td>Subclover</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>2. Alta fescue</td>
<td>6 pounds</td>
<td>Long-lived</td>
</tr>
<tr>
<td>Creeping red fescue</td>
<td>6 pounds</td>
<td></td>
</tr>
<tr>
<td>Orchardgrass</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>Subterranean clover (midseason strain)</td>
<td>5 pounds</td>
<td></td>
</tr>
</tbody>
</table>

(If pasture is for sheep, in mixture 2 Chewings fescue may be used instead of creeping red fescue if there is any advantage in the price of seed. The creeping red fescue is more palatable for dairy cows.)
### FOR GOOD UPLANDS (WILLAMETTE AND THE BETTER AMITY SOILS)

<table>
<thead>
<tr>
<th>Mixture</th>
<th>Rate per acre</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Alta fescue</td>
<td>15 pounds</td>
<td>Suitable for hogs</td>
</tr>
<tr>
<td>Subclover</td>
<td>5 pounds</td>
<td>as well as for</td>
</tr>
<tr>
<td>2. Tualatin oatgrass</td>
<td>12 pounds</td>
<td>other kinds of livestock.</td>
</tr>
<tr>
<td>Subclover</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>3. Orchardgrass</td>
<td>6 pounds</td>
<td></td>
</tr>
<tr>
<td>Alta fescue</td>
<td>8 pounds</td>
<td></td>
</tr>
<tr>
<td>Creeping red fescue</td>
<td>3 pounds</td>
<td></td>
</tr>
<tr>
<td>Subterranean clover (midseason strain)</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>4. Alfalfa</td>
<td>8 pounds</td>
<td></td>
</tr>
<tr>
<td>Alta fescue</td>
<td>8 pounds</td>
<td></td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>9 pounds</td>
<td></td>
</tr>
</tbody>
</table>

(Pasturing alfalfa is discussed on pages 14 and 15.)
Of the above mixtures, the last should be used on pastures intended for use indefinitely. The bentgrass should never be used on rotation pastures.

(Mixture 5 is a short-lived pasture good for only three or four years but will usually out-yield others for that short period.)

FOR HEAVY SOILS THAT MAY BE WET IN THE WINTER (AMITY, WAPATO, DAYTON, ETC.)

<table>
<thead>
<tr>
<th>Mixture</th>
<th>Rate per acre</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red clover</td>
<td>6 pounds</td>
<td>Good for only</td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>9 pounds</td>
<td>3 or 4 years.</td>
</tr>
<tr>
<td>Tualatin oatgrass</td>
<td>6 pounds</td>
<td></td>
</tr>
</tbody>
</table>

FOR HIGHEST QUALITY, WELL-DRAINED VALLEY SOILS (CHEHALIS AND NEWBERG TYPES)

<table>
<thead>
<tr>
<th>Mixture</th>
<th>Rate per acre</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alta fescue</td>
<td>18 pounds</td>
<td>Short-lived</td>
</tr>
<tr>
<td>alsike clover</td>
<td>4 pounds</td>
<td></td>
</tr>
<tr>
<td>White clover</td>
<td>1 pound</td>
<td></td>
</tr>
<tr>
<td>Lotus major</td>
<td>1 pound</td>
<td></td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>8 pounds</td>
<td></td>
</tr>
<tr>
<td>alsike clover</td>
<td>4 pounds</td>
<td></td>
</tr>
<tr>
<td>Lotus corniculatus</td>
<td>1 pound</td>
<td></td>
</tr>
<tr>
<td>Highland bentgrass</td>
<td>2 pounds</td>
<td>Highland bent is difficult to eradicate and is not too palatable for dairy cows</td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>15 pounds</td>
<td></td>
</tr>
<tr>
<td>alta fescue</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>alsike clover</td>
<td>3 pounds</td>
<td></td>
</tr>
<tr>
<td>Lotus major</td>
<td>1 pound</td>
<td></td>
</tr>
</tbody>
</table>

(Of the above mixtures, the last should be used on pastures intended for use indefinitely. The bentgrass should never be used on rotation pastures.)

Mixture          | Rate per acre | Remarks          |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alta fescue</td>
<td>15 pounds</td>
<td></td>
</tr>
<tr>
<td>Subclover</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>8 pounds</td>
<td>Short-lived</td>
</tr>
<tr>
<td>Tualatin oatgrass</td>
<td>10 pounds</td>
<td></td>
</tr>
<tr>
<td>Red clover</td>
<td>8 pounds</td>
<td></td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>15 pounds</td>
<td></td>
</tr>
<tr>
<td>alta fescue</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>alsike clover</td>
<td>3 pounds</td>
<td></td>
</tr>
<tr>
<td>Lotus major</td>
<td>1 pound</td>
<td></td>
</tr>
<tr>
<td>Subterranean clover</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>Orchardgrass</td>
<td>8 pounds</td>
<td>Suitable for hogs as well as for other livestock</td>
</tr>
<tr>
<td>Tualatin oatgrass</td>
<td>6 pounds</td>
<td></td>
</tr>
<tr>
<td>Subterranean clover</td>
<td>5 pounds</td>
<td></td>
</tr>
<tr>
<td>Creeping red fescue</td>
<td>6 pounds</td>
<td></td>
</tr>
<tr>
<td>alta fescue</td>
<td>8 pounds</td>
<td></td>
</tr>
<tr>
<td>White clover</td>
<td>1 pound</td>
<td></td>
</tr>
<tr>
<td>Lotus corniculatus</td>
<td>1 pound</td>
<td></td>
</tr>
<tr>
<td>Subterranean clover</td>
<td>5 pounds</td>
<td></td>
</tr>
</tbody>
</table>

FOR HIGHEST QUALITY, WELL-DRAINED VALLEY SOILS (CHEHALIS AND NEWBERG TYPES)
Wet Lands

The Willamette Valley does not have a large acreage of swampy lands, but many farms have a few acres of seepy, wet soil on low, winding creeks or swales. As a rule such lands are wet part of the year and very dry the other part. On most farms such areas are classed as waste. Taxes are paid yearly on them and fences are kept up, but livestock on most of these acres get only irritation, mosquitoes, and exercise. Soils of this kind can be converted into the most productive land on the farm with reed canary grass or meadow foxtail. Many valley farmers turn envious eyes toward the lush, green Ladino pastures of neighbors and lament that no water is available for summer irrigation on their own farms. Many of these same people have swales that would produce nearly as much feed from meadow foxtail as the good uplands do from irrigated Ladino—and at less than half the cost.

Lotus major and reed canary grass on lowlands at the John Jacob Astor Branch Experiment Station, Astoria.
Meadow foxtail is a water-loving grass that is far more nutritious than reed canary but less productive. It will not actually grow in the water all season as will canary grass, but it will withstand winter flooding. The stock may tend to camp on the meadow foxtail and kill it because of its greater palatability. It withstands close pasturing far better than does the canary grass. It is very early and furnishes feed in the late winter. Seed is usually high-priced.

Reed canary is one of the several tall-growing grasses that objects strenuously to close and continuous grazing. On very wet land it is usually safe, because part of the year the stock cannot get to it. On ordinary wet lands, however, the yield drops off drastically if the grass is kept pastured to the ground, and very shortly worthless sedges, rushes, and weeds come in. On the other hand, if allowed to grow too tall, the grass is not attractive to livestock and mowing may be necessary to reduce it to the immature, young state relished by the animals. On overflow land seeding should be done in the mud just after the water is off in the spring. Rate of seeding is usually 8 pounds per acre.

If the land is wet all the time so that soil preparation is impossible, the best method of obtaining a stand is to grow a row or two of reed canary grass in the garden, plow it up in the early spring, and scatter the roots and stems over the surface of the swamp, stamping them into the mud if possible. A very small piece of root, or even a stem not attached to the root, will usually establish itself in wet ground in a short time provided the stem has a joint.*

Lotus major is the one known legume suitable for wet land. For soils wet only in the winter, its close relative, Lotus corniculatus, is satisfactory. Willamette Valley farmers have never before been offered a legume that will grow with wet feet.

Some good mixtures for wet land are:

1. Reed canary ........................................ 8 pounds
   Meadow foxtail ................................... 4 pounds
2. Meadow foxtail .................................... 8 pounds
   Seaside bentgrass ................................. 1 pound
   Reed canary ....................................... 4 pounds
   Lotus major ........................................ 3 pounds

The proportion of reed canary to use depends upon the degree of wetness. If the land is under water during the winter, use mixture 1; if seepy, but not under water, use mixture 2.

* See U. S. Department of Agriculture Bulletin No. 1602, "Reed Canary Grass," H. A. Schooth.
Good pastures produce heavy yields of high-quality feed, but if these yields are to be maintained there must be a constant supply of available plant foods in the soil: nitrogen to make a lush growth high in protein; phosphorus, lime, and sulphur to supply the legume growth and make feed rich in minerals. All come from the soil, and the soil under pasture is depleted as with any other crop except that the minerals are sold from the farm as meat or milk instead of as crop products. Fertilizers pay on pastures by increasing the yields, by providing better feed, and for the future, pay through an increased accumulation of high-quality organic matter to help succeeding crops.

Nitrogen

The yield from a pasture depends more on the nitrogen supply than on any other plant food. Fortunately, legumes can obtain part of their supply from the air and, as good neighbors, share it with companion grasses. Barnyard manure is a good source of nitrogen, although the supply on most farms seldom equals the need. Even though pastures contain legumes and are treated with manure, the supply is often too little and nearly always too late.

Do not waste fertilizer on weeds and unpalatable shrubs. First improve pasture, then fertilize.
Native grass and weeds on Willamette Valley hills; production very low, probably would not pay to fertilize.

Pastures without legumes require additional nitrogen each year, either as barnyard manure or as commercial nitrogen. Good stands of perennial grasses can profitably use nitrogen fertilizers supplying 40 to 80 pounds of nitrogen or 6 to 10 tons of barnyard manure per acre every season. On pastures containing legumes, 20 to 40 pounds of nitrogen may be enough. The yield, however, particularly under irrigation, can be carried up to almost incredible heights by heavier applications of nitrogen. These heavy doses of nitrogen may drive out legumes unless accompanied by phosphate fertilizers.

Commercial nitrogen will pay even on good legume mixtures and on pastures receiving regular applications of barnyard manure. Unfortunately, the nitrogen from legumes or manures does not become available until the soil is warmed by several weeks of spring sunshine. Commercial nitrogen is immediately available, and applications made in February or March will make a heavy pasture growth by late March or April, a time when pasture is often needed to help stretch a depleted hay supply.

On pastures with legumes or on those receiving manure, one application of nitrogen in early February or March may be enough. Straight grass seedings could profitably use two, one supplying at least 20 pounds of nitrogen before March 1, and another application about April 1. Irrigated pastures could stand a “shot” in September to make late October and November grass. Fall applications on fescue or ryegrass frequently make good green grass all winter.
Bunchgrasses give much greater yield from the use of nitrogen than creeping grasses. It is doubtful if the use of nitrogen pays on bentgrasses, and the return from nitrogen on “volunteer” Canada bluegrass, redtop, and many wild native grasses can be measured mostly by the more pleasing color. In other words, if money is spent for nitrogen, better spend it on a grass that appreciates it.

Twenty pounds of nitrogen would be supplied by 100 pounds of ammonium sulphate, 60 pounds of ammonium nitrate, 125 pounds of sodium nitrate, 125 pounds of 16-20, or 180 pounds of 11-48. The last two fertilizers also carry phosphorus and are ideal materials to use on mixtures of grasses and legumes.

**Phosphorus**

Legumes require much more phosphorus than do grasses, and the hill soils have less available phosphorus than do the valley-floor soils. The annual use of phosphate fertilizers is necessary to maintain a hardy, vigorous stand of legumes on many hill soils and is
a "must" on the high-producing irrigated Ladino pastures. It deserves a fair trial on any soil. On some soils, phosphorus helps straight seedings of grasses, but these applications are usually much more profitable if accompanied by an application of nitrogen. Phosphorus is a ticklish fertilizer to use. Often applications are entirely wasted. Phosphorus must be applied in the fall if possible. Top dressings applied in February or March, preferably February, will help, but if spring applications cannot be made by mid-April, they might as well be omitted. Light applications are often wasted. Start with 60 pounds of phosphorus (P₂O₅) each season and experiment a little with lighter rates. Soils vary greatly. Some will respond very well to lighter rates. On soils known to respond to phosphorus, make generous applications at seeding time, with annual applications thereafter.

Sixty pounds of phosphorus (P₂O₅) can be supplied by 300 pounds of 20 per cent superphosphate, 135 pounds of 45 per cent treble phosphate, or 125 pounds of 11-48-0.

Sulphur

Legumes respond to sulphur on all Willamette Valley soils, but always apply the sulphur as landplaster, ordinary superphosphate, ammonium sulphate, or ammonium phosphate (16-20), never as straight sulphur. Straight sulphur will give the same results in this area as it does in eastern Oregon, but the continued use rapidly increases the need for lime in western Oregon. When landplaster is applied alone, apply at least 100 pounds per acre. Alfalfa can use 150 pounds and irrigated Ladino clover, 200. Landplaster will give best results if applied in February or early March. Sulphur equal to 100 pounds of landplaster is supplied by 200 pounds of ordinary 18 to 20 per cent superphosphate, 66 pounds of ammonium sulphate, or 130 pounds of 16-20 ammonium phosphate. (Either of these materials can be substituted for landplaster.)

Lime

Lime is often necessary to obtain and maintain a stand of legumes. Hill soils are especially deficient. Lime is seldom a factor in the production of straight grass, and legumes vary greatly in their requirements. Subterranean clover may grow on acid hill soils without additional lime, while alfalfa may require lime on some of the better bottom lands. The need for lime can be determined easily and
definitely by a simple soil test that can be made free of charge by the County Extension Agent. There is no need to waste money on lime if it is not needed. Always determine the need for lime and apply it in advance of seeding. Applications made as top dressings to revive a poor stand of legumes invariably result in failure. The rate of application will vary with the soil. Usually one or two tons per acre are required. One application should last up to six or seven years.

Barnyard Manure

Barnyard manure will make more return applied to a good pasture than to most other crops. It helps the pasture and the succeeding crop. For example, the best way to fertilize corn is to manure a rotation pasture a year in advance of the corn crop. The result is an increased yield of pasture followed by an increased yield of corn—a double dividend. The same thing would apply to any other crop.

Manure should be applied early, in March or early April. Aim for light applications, 6 to 10 tons to the acre. A good spreader will permit light applications, will spread evenly and will thereby avoid undesirable bunches. If the spreader does not do a good job, a light harrowing should follow one or two weeks after the manure is spread. Livestock dislike to start grazing on a manured pasture. In fact, when only part of a field is covered, they will graze the unmanured part into the ground and let the better grass go to waste. Out-fox them by always covering an entire field. If the entire field is covered, the stock may hesitate for a few days, but from then on there will be no difficulty. Barnyard manure handled by a liquid tank method is ideal for pastures. This method saves all of the plant food, and through the use of a sprinkler wagon and a pump, all of the back-breaking work is avoided. With the liquid, it is possible to make light, even applications.

Manure is a high nitrogen fertilizer but is low in phosphorus. It usually pays to use the two together; they help each other. The manure makes the phosphorus more effective, and the phosphorus helps prevent the loss of nitrogen from manure. Phosphorus can be spread at the same time as manure merely by spreading 35 to 50 pounds of superphosphate or its equivalent in treble phosphate over each load of manure as it is hauled to the field. Many farmers are now going this practice one better and are applying the phosphorus to the manure in the barn. Phosphate is equal to lime as a deodorant and disinfectant, and in addition, it helps to preserve the nitrogen that might otherwise be lost.
WILLAMETTE VALLEY IRRIGATED PASTURES CANNOT BE EXCELLED FOR PRODUCTION. Yields of irrigated Ladino clover-grass mixtures justify considerable expense for irrigation. An irrigated pasture reaches its peak of production in midsummer when most other pastures are nearly dormant. Willamette Valley farmers are using many different methods of irrigating pastures. Most of the pastures are irrigated by pumping from wells and streams. An increasing acreage is irrigated from gravity water, usually supplied from community irrigation systems. Various types of sprinkler irrigation are widely used.

The type of irrigation should be carefully adapted to the needs of each individual farm. Surface methods will usually require the least investment and the least operation costs and should generally be used where an ample supply of water is available and the land can be prepared properly. A good pasture will last many years, so a good job of land leveling is justified to save water and labor. Sprinkler irrigation permits the watering of land too rough for surface methods; it allows the utilization of limited supplies of water and provides for irrigation of soils with extremely poor subsoils on which surface methods would be impracticable. Two general methods of sprinkling can be used: revolving sprinklers or perforated pipe. Revolving sprinklers have a particular advantage on small acreages in that the labor of operation need not interfere with other farm work. Revolving sprinkler systems can be designed so that the portable pipe is moved either twice a day or three times a day where the use of electrical power permits day and night operation.

An irrigation system usually costs considerable money. It is good business to get the right type of equipment for each farm. Willamette Valley county extension agents are in a position to furnish detailed information applying to each farm. Pastures can use at least 24 inches of water during the season. Aim to apply 3 to 4 inches every 2 weeks during midsummer. Start early in the season—in May or early June. Never let a pasture slow down for lack of moisture. Do not let late summer or early fall showers fool you. Keep irrigating until October if necessary.

Irrigation enables a man to get almost fabulous pasture yields through heavy use of nitrogen. Extra nitrogen makes extra growth that uses more water. Supply enough water, and still more nitrogen.
Fertilization and irrigation go together. Additional water allows use of more fertilizer, which calls for more water. The combination produces fantastically high pasture yields. This can be kept up until some limit is reached that is not known now. Pasture growth equivalent to 11 tons of hay is obtained by some Willamette Valley and southern Oregon dairymen. This is impossible without plenty of water and plenty of nitrogen.
Work for a Year-Round Pasture

The western Oregon climate allows such a diversity of crops that if one blends them skillfully he can have very close to 12 months of pasture—barring “unusual” weather. If irrigated pasture is available, the problem is simplified, because on many farms the critical period is in July and August.

There is no one sure-fire, all-weather system that will apply to all farms. The following suggestions include things that will work on some farms and by choosing the right combination, any grower can pick out the things that will fit his soil type, acreage, kind of livestock, personal preferences, and cropping practices.

Winter rye or crimson clover, or a mixture of both, will usually provide more winter feed than any other crop. Subterranean clover, rye, and vetch will make more spring pasture; alfalfa, red, or alsike clover, or sweet clover, will outyield all rivals for summer use, and first-year sweet clover or rape and crimson clover will be outstanding in the fall.

<table>
<thead>
<tr>
<th>Month of Pasturing</th>
<th>Pasture Possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>December, January</td>
<td>Fall-planted rye, preferably Giant Winter or Abruzzi; fall barley; ryegrass; spring-planted crimson clover.</td>
</tr>
<tr>
<td>February, March</td>
<td>Winter rye; fall-planted vetch; crimson clover, preferably planted the spring before, either alone or with ryegrass or rape; subterranean clover. Perennial grasses with fall application of nitrate fertilizer.</td>
</tr>
</tbody>
</table>

Grain used as part of a year-round pasture system.
Month of Pasturing | Pasture Possibilities
--- | ---
April | Vetch (any variety fall-planted); crimson clover; fall-planted grain; subterranean clover; ryegrass or alta fescue with 40 pounds of nitrogen, fall applied.
May | Permanent mixed grass; fall-planted grain; red or alsike clover; crimson clover; subterranean clover.
June | Permanent mixed grass; clover (red, alsike, or sweet); spring grain; subterranean clover.
July | Spring grain; Sudan grass; spring-planted common ryegrass; sweet clover; alfalfa; alta fescue.
August | Spring-planted varieties of true winter rye; Sudan grass; alfalfa; sweet clover; red clover; rape; crimson clover.
September | Spring-planted winter rye; rape; Sudan grass; first-year sweet clover; spring-planted crimson clover.
October, November | Permanent mixed grasses; first-year sweet clover; crimson clover.

Somewhere in the combinations shown in Table on page 32 is one that will fit nearly every farm in the Willamette Valley. No attempt has been made to list every possible combination.

If one has too much feed in the spring, he may “can” it by ensiling with molasses or with chopped grain. This gives some high-protein feed for use later in the dry summer when available feed may be low in protein. The milk flow may be kept up that way without recourse to expensive protein concentrates.* The permanent grass listed with all combinations is a sort of safety valve. Although listed primarily for winter feed, actually something else, such as common ryegrass, fall rye, or crimson clover may be used, leaving the grass for spring. If the grass is used wisely, and especially if there is a legume with it, the grass pasture may be used at times all through the year. If not eaten too closely, it may thus remain in reserve for use for a few days whenever one of the temporary pastures needs resting.

<table>
<thead>
<tr>
<th>Soil types</th>
<th>In late fall, winter, and spring use</th>
<th>In late spring and early summer use</th>
<th>In late summer and early fall use</th>
<th>In fall and spring supplement with</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productive soils</strong> (Chehalis, Newberg, Willamette)</td>
<td>Permanent grass-legume pastures</td>
<td>Second-year sweet clover</td>
<td>First-year sweet clover and Sudan grass</td>
<td>Spring-planted ryegrass and crimson clover</td>
</tr>
<tr>
<td></td>
<td>Permanent grass-legume pastures</td>
<td>Alfalfa</td>
<td>Alfalfa</td>
<td>Alfalfa</td>
</tr>
<tr>
<td></td>
<td>Permanent grass with nitrate fertilizer</td>
<td>Clover and ryegrass, first- and second-year clover</td>
<td>Clover and ryegrass, first- and second-year clover</td>
<td></td>
</tr>
<tr>
<td><strong>Less productive soils</strong> (Amity, Dayton)</td>
<td>Permanent grass-legume pastures with nitrate fertilizer for winter</td>
<td>Spring-planted rye</td>
<td>Sudan grass</td>
<td>Hairy vetch</td>
</tr>
<tr>
<td></td>
<td>Permanent grass-legume pastures with nitrate fertilizer for winter</td>
<td>Fall-planted common ryegrass and crimson clover</td>
<td>Spring-planted common ryegrass and crimson clover</td>
<td>Spring-planted alsike clover and ryegrass</td>
</tr>
<tr>
<td><strong>Hill lands</strong> (Olympic, Aiken, etc.)</td>
<td>Permanent grass-legume pastures with nitrate fertilizer</td>
<td>Subterranean clover</td>
<td>Spring-planted fall rye</td>
<td>Fall rye for early spring</td>
</tr>
<tr>
<td></td>
<td>Permanent grass-legume pastures with nitrate fertilizer</td>
<td>Sudan grass</td>
<td>Crimson clover</td>
<td>Hairy vetch and rye (early spring)</td>
</tr>
<tr>
<td></td>
<td>Permanent grass-legume pastures</td>
<td>Second-year red clover</td>
<td>First-year clover and rape</td>
<td>Third-year red clover and common ryegrass for spring</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>
No crop puts organic matter into the soil so fast as does a well-fertilized pasture. Pastures are thus ideal in a crop-rotation system.

Grain, vetch, and grass will all remain green far beyond the normal maturity date if kept eaten down. All are likely to furnish more feed and stay green better if pastures are divided, thereby forcing the stock to eat the feed in each enclosure more quickly and more thoroughly. This system of small pastures was not practicable until the electric fence arrived. The wise use of an electric fence makes it possible to pasture crops to far better advantage.
Native grass pasture on Dayton soil (white land) can be improved by (1) drainage, (2) good seeding, (3) fertilization, and (4) irrigation. Remove surface water or install drain tile. For grasses use alta fescue or English ryegrass. For legumes use ladino clover with irrigation, or alsike clover or lotus without irrigation. Make liberal application of nitrogen in spring and fall along with phosphorus under irrigation. With water and fertilizer, pasture yields on Dayton soil can be phenomenal.

High producing pastures will grow on flat wet land.
Good Pasture Management

A FEW DEFINITE PRINCIPLES APPLY to the management of pastures:

1. A pasture with a legume will yield roughly twice as much as will the same pasture without a legume. The legume drags the unwilling nitrogen down from the air and pays for board and room by supplying nitrogen to the grass. Subterranean clover and Lotus fill long-felt needs—the subterranean clover for well-drained lands, the Lotus for wetter lands. Red, alsike, and white clover and alfalfa are seldom permanent, but their effects will last for several years after they disappear. Alfalfa is in a class by itself but will not grow in all soils.

2. A grass pasture will increase in yield through rotation with other crops. Thus “permanent pasture” is not the best use of land that can be plowed and sown to other crops. Steep slopes or other eroding land should be left in grass indefinitely. Professor R. G. Stapledon of Aberystwyth, Wales, perhaps the leading pasture authority of the world, says:

   Permanent grass, where it is possible to plow, is wrong in theory, wrong in fact, uneconomic and ridiculous. How often to plow is a matter of circumstance—once in 100 years is better than never; once in 20 is better still; and once in 10 is often sufficient. Plow more frequently and you begin to be scientific, progressive, and a farmer in very truth, for then you begin to avail yourself of the labors of the plant breeder and you begin to build fertility at a prodigious pace.

   Pasture grass as a builder of organic matter is the most valuable asset we have in farming. Grass roots are produced in enormous quantities and each year much of the root system dies, while new roots push out and absorb the plant food liberated by those decaying. Thus the top foot of pasture soil is a teeming chemical laboratory working out intricate soil fertility problems in an endeavor to help the owner. But the owner, unless he plows the pasture, cannot profit to best advantage by that increased fertility. He can harvest and sell it only by plowing the land and growing crops. This process in turn tears down and uses the organic matter stored by the pasture grasses, and after a short time the land should again go back to the grass or to a legume—or better yet, to a mixture of the two. This process improves crops, pastures, and owner’s credit ratings. This principle of grass rotation should not be used on steep land that should be left in grass forever to prevent erosion.
3. The same practice year in and year out, repeated at the same time each year, will affect the pasture adversely by reducing the number of grasses. Thus, if one turns the stock onto pasture each spring when it is 3 inches high, or if manure is applied at the same time each year, or if hay is cut at the same stage of maturity—if any one practice is followed regularly—some grasses will be hurt and others helped. A year or two of such hurting or helping may not matter, but eventually the injured species dies.

4. Clip pastures with a mowing machine whenever they start to seed or when they get bunchy. Clip at least once every season, maybe twice, and perhaps more if land is irrigated. Mowing helps to keep unpalatable species and weeds under control. Waste of good feed is prevented—livestock do not like mature woody growth. Clipping helps maintain a good balance of grasses and legumes.

5. On nonirrigated lands, grasses should be allowed to reseed every 3 or 4 years. This is not so much to scatter new seed as it is to replenish the root systems of the grasses already there. This rule does not apply to irrigated pastures or to moist bottom lands. It is particularly important with the tall-growing grasses such as tall oat and reed canary grass.

6. Involved, expensive mixtures are a waste of money. Usually the one best grass and the one best legume will outyield more complicated mixtures. In most cases not over 4 or 5 grass and legume species will live together. Too many people cannot live in the same house, and one should not expect too many grasses to live happily together. Mixtures should often be varied within the field. Wet places, dry spots, thin soils, etc., need different species.

7. Most grasses have strains or varieties. In general, the low-growing leafy strains will provide more pasture but less hay than the upright, taller strains.

8. Young grass is far higher in protein than mature grass. This fact should be remembered in feeding dairy cows. Those getting plenty of immature grass may need grain but do not need
Beef cattle on Walt Fisher farm, Clackamas County. Good grasses and legumes are putting beef onto many western Oregon farms.

protein supplements. Any stock pasturing on mature grass, no matter how plentiful the supply, will need additional protein to maintain their weight.

9. Each pound of feed from a good pasture costs the owner only half as much as a pound of feed in the manger or feed box. Some pastures produce at only one-fourth the cost of barn feeding.

10. An average cow on the very best pasture cannot get more than 150 pounds of grass per day. This gives enough protein for the very high production of 80 pounds of 4 per cent milk, but it has not over 30 pounds of dry matter as a rule. Thus, the 150 pounds of green grass can supply only enough energy for a 1,000-pound cow giving about 40 pounds of 4 per cent milk. As a matter of fact, pastures where cows can get 150 pounds of grass are very few and the average good pasture will afford nearer 100 pounds per day. In such a pasture a cow cannot maintain production on pasture alone if she is giving more than 22 pounds of 4 per cent milk.

*Figures from chart developed by Roger Morse, Extension Dairyman, Extension Service, Oregon State College.
11. Palatability is not so important as people formerly thought. An otherwise unpalatable grass can be made palatable by fertilizing, concentrating cattle on a small area, moving them frequently, and by mowing the pastures. Thus, alta fescue is not a really palatable grass, but many western Oregon farmers are using it with high-producing cows.

12. Work at Washington, D. C., indicates that cows can get only 6 per cent of the young grass available on one acre in one day. A pasture must be fairly lush to enable the cow to gather as much as 150 pounds per day. Such a pasture would need to have 2,500 pounds of green grass available.

13. Very young grasses tend to analyze about the same. Even the poorer grasses, such as velvet grass, are about as nutritious as the best ones when both are young. There is, however, considerable difference in palatability, and the difference increases rapidly as the grass matures.

14. The chemical composition of grass may change markedly with the soil type. In general, the less fertile soils produce pasture grass of lower feeding value. Addition of commercial fertilizers may or may not correct the situation.

15. The mineral supply in the soil will last at least five times as long in a field used for pasture as it will in a field growing crops for harvest. This is true because animals utilize only 20 per cent of the minerals and return 80 per cent to the soil to be used over and over again by the growing plants.

16. No crop can use available soil fertility so well as a good pasture. This is true because some grass or legume is growing nearly every day in the year. As fertility is made available in the soil by the complicated decay processes going forward all the time, it is likely that one of the various plants in the pasture can take up and use that fertility. In the case of a single crop, such as wheat, the fertility made available at certain times during the year may be
washed away or leached out; the bargain fertility goes to waste for want of a buyer. Pasture is thus a 12-month employee while grain works for the owner only a few months.

17. Pasture mixtures containing legumes require less nitrogen than straight grass, but sooner or later they will need phosphorus and may need lime.

18. Pastures respond to heavy applications of nitrogen fertilizers every year.

19. The creeping grasses stand more abuse than the bunch-type grasses. Creepers are Highland bent and creeping red fescue. Bunch-type grasses are those such as orchardgrass and tall oatgrass. Certain others are somewhat intermediate, as meadow foxtail and reed canary. The creepers are thus best for places where livestock congregate, but are lower yielding than the bunch types. For most conditions, a bunchgrass will outyield a creeper.

Good pasture crops reduce grain required to make 100 pounds of pork.