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# An All-Year Pasture System For Missouri

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Fig. 1.—Bluegrass long has been a foundation crop of Missouri agriculture. It holds the key position in the all-year pasture system.

Good pasture nearly the year round is now within the reach of every Missouri farmer.

This is an important development in Missouri agriculture. Our pasture season has been mainly the season of bluegrass—the six or seven months from spring to fall. Grain crops grazed sparingly so

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that grain yields would not be much reduced, and the low grade pasturage from corn stalks, have not greatly added to the feed supply from our normal six months of grass. Only within recent years have we fully discovered the abundant pasturage from grain crops grazed through the fall, winter and spring to the limit of their carrying capacity. And only within recent years have we found forage crops that could be heavily pastured for long periods within the bluegrass season. These forages are principally Korean lespedeza on a very great scale and sweet clover and Sudan grass each on a minor scale. They can fill the wide and wasteful gap in our pasture supply, caused by the seasonal shortage of grass in July and August, when stored feeds are running low and plenty of pasturage is necessary to maintain a good flow of milk or to increase the gains of meat animals. They are, therefore, the means of overcoming one of the most serious deficiencies in our whole system of farm production.

We can now practically double the length of our former pasture season, and treble the amount of feed which it produced, by the correct combination, the accurate adjustment of acreage, and the orderly seasonal use of permanent pastures, Korean lespedeza, early sown fall grain, first and second year sweet clover, vetch, and crimson clover.

### **Pasture Is a Crop**

Pastures can do more than hold the soil against erosion or make limited use of land too rough or too poor to cultivate. Good pastures managed efficiently produce yields of animal products that would be profitable even on good crop land. During the three-year period, 1946 to 1948, beef cattle gained 288 pounds an acre annually on brome-grass and a legume mixture, 284 pounds on wheat and lespedeza, and 218 pounds on renovated bluegrass near Lathrop, Missouri. During the same three-year period, cattle gained 243 pounds on bluegrass and lespedeza and 222 pounds on redtop and lespedeza near Columbia, Missouri, on land that does not produce good yields of corn. Cattle gained 275 pounds an acre on five different grass-legume and grain-legume pasture mixtures near Sikeston, Missouri, during the unfavorable growing season of 1948, although two of the cereals had been sown too late, and one of them was harvested as grain. Because this production is made at no cost for harvesting and at small cost for soil depletion, the net return from pastures compares favorably with that obtained from land growing grain, cotton, or hay.

### **How the Combination Is Made**

These main crops of the all-year pasture system may be grazed in seasonal progression as follows:

**Permanent pasture** from early April to late June in the south and from late April to early July in the north—approximately 75 days. Its growth from mid September to late November should be saved for winter use.

**Korean lespedeza** from late June or early July until late September or early October. This 90-day period of grazing will finish the lespedeza but the stand will not fail to reseed itself for a thick new growth in the following spring, even if pastured short.

**Rye, winter barley, or first year sweet clover** from early October until the first or middle of December. Heavy grazing for 60-75 days will be as much as rye and barley can stand before they renew growth in the spring, and sweet clover will have little feeding value after the tops are frozen.

**Permanent pastures** again from the first or middle of December until the end of February. This will be the grass left by the fall growth and saved for winter. It, of course, is to be supplemented with stalk pasture and hay. The winter period of approximately 100 days will bring the least pasturage of the whole year. But if a good stand of grass has been saved from the late summer and early fall growth, it may then become more valuable than in any other season, because of the high price of winter feed.

**Wheat** grown for grain usually furnishes some winter grazing in the southern part of the state.

**Rye, winter barley, or wheat** from the middle of March or first of April until the permanent pasture is ready in April. The grain crop may be grazed out completely in May, or left to ripen grain, by suspending grazing the middle of April. Naturally the grain yield will be much reduced if the crop is heavily pastured in the spring.

The seasonal periods stated here for the grazing of the different pasture crops are only approximate and will be found to range earlier or later according to the section of the state and the variable nature of the seasons themselves. The system can be outlined even more simply by saying that it is composed of (1) permanent pasture in late spring, early summer and winter; (2) lespedeza pasture in mid-summer and late summer; and (3) rye, barley, or other grain pasture through the whole fall and early spring. Thus the whole year may be filled with good pastures, even abundant pastures by comparison with those we have formerly known. And the system is so closely connected that intervals of time between the end of one pasture and the beginning of the next will be very short, or the pastures may overlap—a new one being ready before the last is finished.

### Permanent Pasture

Grazing should begin on the permanent pasture as soon as the grass has grown to an average height of 3 or 4 inches. This usually will occur by mid-April in central Missouri, a week later in northern Missouri, and two weeks earlier near the southern border of the state. Starting to pasture too early compels livestock to expend too much energy in obtaining the feed they require. However, starting too late allows the grass to make a rank growth that declines quickly in palatability and digestibility and that tends to suppress low-growing legumes. Korean or Kobe lespedeza, Ladino clover, birdsfoot trefoil, or some other adapted legume should be established and maintained in grass sod for otherwise permanent pastures will not yield the quantity and quality of forage required for profitable production.

The permanent pasture should be grazed heavily enough to use most of the grass as it grows. A naturally good or improved pasture will carry one cow or two-year-old steer an acre during the April to July period of an average season. Undergrazing is wasteful because mature grass has little feeding value, and overgrazing reduces milk production or gains in weight by making it impossible for livestock to obtain the feed they require during the 8 hours of each day that they are willing to spend in grazing.

Bromegrass and Ladino clover or redtop and lespedeza should be grazed to an average height of 3 or 4 inches during May and June. Grasses with basal leaves are, however, never eaten down uniformly unless badly overgrazed. The intensity of grazing in pastures that contain bluegrass, orchard grass, or tall fescue is indicated by the comparative size of grazed and ungrazed areas. If more than 25 per cent of the pasture remains ungrazed by June, it is understocked, but if less than 10 per cent of the total area remains ungrazed, overgrazing probably will occur before lespedeza pastures are ready.

If grazing is suspended in early July to save subsequent growth for winter, the permanent pasture should be mowed to remove unused grass and weeds which, if left standing, would lower the quality of the growth saved for winter pasture. If summer rains stimulate the growth of crabgrass, foxtail, and other annual weedy grasses, this growth should be removed before mid-September by grazing, mowing, or by both grazing and mowing.

Resting permanent pastures from mid-September to December not only accumulates growth suitable for winter use, but it also enables the grass to manufacture and store food reserves that are depleted by spring grazing and summer heat. This preserves the stand of grass and increases its productivity during the following year.

Redtop is less useful for winter pasture than many other grasses

because its leaves are more completely browned by cold. Tall fescue (Alta or Kentucky 31) and bluegrass are more valuable for winter pasture because their leaves retain more green color during winter. Tall fescue fertilized heavily with ammonium nitrate (200 pounds an acre) or equivalent amounts of other nitrogenous fertilizers after the first good September rains, makes such rapid fall growth and retains green color so well that it might even be substituted for rye, wheat, or winter barley for late fall and early spring pasture. It would have the advantage of providing a firmer footing on heavier soils softened by rain or thawing.

### Korean Lespedeza Pasture

Korean lespedeza is a highly nutritious pasture plant that can be grown anywhere in Missouri. Even on medium or poor soil it does not require special treatment as do most other legumes. Lime, phosphate, and potash applied to soils deficient in these plant foods will, however, increase substantially the yield of lespedeza. It is exceedingly durable under grazing and will survive a drought that may injure or ruin many other crops. In fact, the great popularity of this lespedeza is mainly due to its ability to give a flourishing pasturage through the



Fig. 2.—Korean lespedeza, where once established, will come up thickly in the grain crops every spring. The picture shows a heavy volunteer stand ready for grazing soon after the oats crop was harvested.

heat of mid-summer when permanent pastures have been reduced to their lowest and least useful stage.

Korean lespedeza is now being grown on 8 to 10 million acres of Missouri farm land ranging from the best to the poorest. This acreage is much larger than that of all other Missouri legume crops combined.

A simple way of starting lespedeza is by sowing in late winter or early spring. Twenty to 25 pounds of seed to the acre will produce a good stand the first summer. The next spring a thick stand will come up from the abundance of seed shattered to the ground during the previous fall and winter. Every fall there will be this plentiful natural reseeding, even though the stand has been grazed down to the ground. The dense volunteer growth, coming year after year, is a highly reliable feature of this crop. Therefore a stand of lespedeza once established is not expected to run out, though it may easily be subdued for a season by putting the land in corn. If the corn land, however, is next plowed for oats, so as to bring much of the buried lespedeza seed back near the surface, there will be a volunteer stand of lespedeza in the oats crop.

Lespedeza is most economically produced in association with wheat, oats, barley, or rye, just as red clover is grown with any of these grains. Within a week or two after the grain crop has been harvested the lespedeza usually will be ready for grazing.

An annual rotation of lespedeza with any grain crop may be carried on as long as desired. The yearly lespedeza-wheat rotation requires only three simple steps: (1) Sow lespedeza in the wheat. (2) Pasture out the lespedeza after the wheat is harvested. (3) In early October, disk the lespedeza sod thoroughly, and on this good but inexpensive seedbed, sow the wheat. This procedure may be repeated year after year, except that the lespedeza will not need to be sown after the first spring, for in this rotation it will volunteer every season in the wheat. This method is equally effective for the combination of lespedeza with oats, barley, or rye, except that in the case of oats the lespedeza sod is disked in the spring instead of in the fall.

It is to be noted, however, that the rotation of volunteer lespedeza with winter barley or rye cannot be perfectly timed in Missouri, if the longest fall grazing of the barley or rye is primarily desired. Either of these grains to yield its maximum fall pasturage must be in the ground by late August or early September, and this time will be from four to six weeks before the lespedeza seeds have ripened. If these seed are still green when they are disked under in preparing the lespedeza sod for the grain crop, there will be a poor stand of lespedeza in the grain next spring, or possibly none at all. But if the barley

or rye is grown primarily for grain, and therefore sown as late as the time of seeding wheat, it will fit as well as wheat or oats in the annual rotation with lespedeza. Also if lespedeza is newly seeded in the grain crop every spring, it can rotate with barley or rye fall-sown early on lespedeza sod.

In the lespedeza-oats rotation, an early maturing variety of oats should be sown at a medium rate. In good seasons the oats should be allowed to ripen; in poor seasons, cut for hay. In either case there will be a valuable feed crop in June, followed by maximum returns from the lespedeza pasture for the rest of the season. Volunteer lespedeza alone becomes weedy. Oats sown on the lespedeza sod keep down the weeds, thereby increasing pasture returns after the oats are harvested.

All things considered, the most efficient and most economical means of producing lespedeza pasture is by the lespedeza-wheat or lespedeza-oats rotation. Either of these can be carried on as long as wanted. Land so used will be receiving every year a heavy addition of nitrogen through the grazing down of the lespedeza. If the grain crop grown in rotation with the lespedeza is normally treated with 0-20-0, 0-20-10, 0-14-7, or similar fertilizer every year, the fertility of the soil will be maintained or even increased.

The yield of feed in terms of pasturage from Korean lespedeza is remarkably high. An acre of lespedeza fully utilized for its 3-month season will produce 100 or more pounds gain in weight by beef cattle. Gains up to 145 pounds have been obtained from an acre of lespedeza after harvested rye, and up to 200 pounds an acre after pastured wheat.

### **Fall and Spring Grain Pastures**

Fall-sown grain crops fully utilized for pasture in both fall and spring can yield a large amount of highly nutritious feed. For pasture purposes they should be sown early and thick. The maximum pasturage will be obtained if grazing starts very early in the fall and proceeds until winter at an even rate that finally will leave just enough growth (about 3 inches) to stand cold weather. Spring grazing may be regulated according to the immediate need for pasturage and the future need for threshed grain. If the greater necessity is for pasturage, the crop may be grazed out completely. If threshed grain for sale or summer feed is the main requirement, the spring growth must be spared from heavy grazing so the crop may develop its grain yield.

In comparison with rye or barley, wheat sown in late August for pasture would become so exhausted by intensive fall grazing and by



Fig. 3.—The vigorous, leafy growth of winter barley comes from early sowing, and furnishes abundant pasturage through a long fall period.

the attack of Hessian fly that it would be badly killed by the winter.

Winter barley is more productive than rye on medium to good land. Rye, however, has the special ability to grow at a low level of fertility and therefore should be preferred to barley on poor land. Rye is also much less likely to winterkill in the northern half of Missouri, where winter barley, because of its insufficient winterhardiness, should not be grown for pasture.

Oats, being spring-sown in most of Missouri, are not comparable on a pasture basis with the other grain crops, except as spring pasture. Even as spring pasture oats are much less productive than a full growth of barley, wheat or rye. Oats lack the rugged ability of the other grains to stand trampling and to continue growth after being partly eaten down. Winter barley, for example, can be grazed at least moderately in the fall and by its vigorous renewal of growth still yield more pasturage the following spring than oats sown in that season. An acre of land that is to be used for grain pasture will be found far more productive if fall-sown in winter barley, wheat or rye than if spring-sown in oats. The more cold resistant varieties of winter oats—Fulwin, Wintok, Forkedeer, and Winter Fulghum—however, compare favorably with other fall sown grains for pasture in the Southeast Missouri lowlands.



Winter barley to give its largest, best distributed and most useful pasturage, should be sown at two bushels per acre right after the rains in late August or early September. In favorable seasons it will be ready for grazing in late September or early October and from then until the first or middle of December it will furnish abundant pasturage. Spring grazing, beginning March 15 to April 1, may run for 30 to 50 days, the length and intensity of such grazing being regulated according to the individual need for pasturage or a yield of threshed grain. Thus the combined fall and spring grazing periods of winter barley may range from 100 to 125 days.

A crop of barley intended primarily for grain, however, should not be sown before late September or early October. During November it can be grazed much more than a crop of wheat also intended for grain; but it can not stand without a loss in future growth and grain yield the extremely heavy grazing given barley being grown and used primarily for pasture.

The bearded varieties—Reno, Michigan Winter, and Kentucky Number 1—are more winter hardy and have produced larger yields of grain than other varieties of winter barley tested in Missouri. Missouri Early Beardless, a hooded variety, is equally good for pasture, but is slightly less winter hardy and yields less grain.

The difficulty of annual rotation between rye or winter barley sown mainly for pasturage and volunteer Korean lespedeza has already been explained. But these crops fit perfectly in annual rotation with soybeans. The steps are: (1) Sow and use rye or barley for pasturage or grain or a combination of both, as desired. (2) After the grain crop has been grazed out or harvested in late May or early June, thoroughly disk or plow the grain stubble and sow soybeans. (3) Harvest the soybeans for hay in August. (4) Sow barley again, with little or no preparation of the soybean land. This rotation will give at very low cost a large annual yield of highly nutritious feed in pasturage and hay, and will practically control soil erosion.

### **Sweet Clover Pasture**

Sweet clover is a good pasture crop in feeding value and carrying capacity. It grows vigorously on productive, well drained soils naturally rich in lime. It will grow also on soils low in fertility, if lime and mineral fertilizer are heavily applied.

Successful stands of spring-sown sweet clover will make good pasturage in early fall, and heavy pasturage during April to July the following year.\*

\*See Missouri Agricultural Experiment Station Circular 323, Sweet Clover Management in a Pasture System.

### **Sudan Grass Pasture**

Sudan grass sown on average land in late May or early June will make good pasturage for 90 to 100 days beginning about July 1. It is nutritious, palatable, durable under grazing, and drought resistant. Altogether Sudan grass is one of the most reliable and productive crops for a summer pasture.

The ground for Sudan grass should be well prepared and the seed drilled or broadcast at 20 to 30 pounds per acre. Grazing may begin when the grass has grown to 8 or 10 inches, and be regulated to maintain that height through the season.

There are occasional reports of livestock poisoning by Sudan grass, similar to the poisoning by other sorghums, particularly sweet sorghum (cane). Such cases occur at the height of a drought. Sudan grass is less likely than the other sorghums to form this poison (hydrocyanic acid) in killing quantity. Therefore the purity of Sudan grass seed is a matter of special importance. This seed should be entirely free from mixture with the seed of any other kind of sorghum or of hybrids of Sudan grass and sorghum.

### **Winter Vetch and Crimson Clover**

Winter vetch is a useful legume for late spring and early summer pasture on fertile, well drained land in the southern part of the state. For a pasture it should be sown with barley or rye, at the rate of 15 to 20 pounds per acre in late August or early September. Inoculation is important for this crop.

A good stand of vetch will extend the pasture season in early summer, beyond the pasturing period of wheat, rye, or barley alone. If the vetch is not grazed too close and the animals are removed in early July, the crop will usually continue growth and produce enough seed to renew its stand on the same land in the fall. By disking to cover the seed, and reseeding the fall grain on the vetch sod, the vetch can be made to renew its stand annually, improve its growth, and add considerable fall pasturage to the grain pasture with which it is combined.

Crimson clover, a winter annual, is a valuable pasture legume for late fall, winter, and spring. In Missouri the practical use of crimson clover is limited generally to the southern half of the state and the plant is there adapted only to warm and well drained soils of average to good fertility. The crop should be sown in late August or early September at the acre rate of 12 to 15 pounds of seed in combination with 5 to 6 pecks of barley or rye. Crimson clover should not be sown alone for a pasture, except where it is known to grow

vigorously on soil well suited to its needs. Nor is it to be recommended for any purpose on soils low in fertility, poorly drained, or acid.

Crimson clover, though a good seed producer in Missouri, cannot be depended upon here to reseed itself as vetch and lespedeza do.

### Benefits from All-Year Pastures

An abundant supply of good feed well distributed through the year and produced at low cost, will be the first great return from the year-round pasture system. This of course is a major factor in the profitable production of meat and milk.

Feed production by means of pastures is much less costly in mechanical operations than the type of production which includes the tillage and harvesting of crops. It is economical also in a broader sense. It is, for one thing, safer from crop hazards. The crops in the pasture system here outlined are either (1) drought resistant, as lespedeza, Sudan grass and sweet clover, or (2) as fall and spring grain pastures they do not come in the drought period, or (3) as bluegrass or redbud they need not be used in the drought period. Altogether this system largely will insure us against heavy feed losses from drought. Also the insect injury to these pastures will be small by comparison with that which often ruins corn or some other heavy cultivated feed. Even the chinch bug, though a voracious pest of a barley crop that stands until ripe, is avoided by the grazing out of the pasture barley in spring before the bug reaches the height of its activity.

The relation of an extensive system of pastures to the more efficient use of land and the preservation of its fertility, is an exceedingly important question requiring broad special treatment. It may be said briefly here that pasture grasses and legumes by reason of their natural economy in the use of soil fertility can be more widely grown than grain crops. Selected species of these plants, besides using their allotted acreage, can fill infertile places on a farm, where grain crops, including corn, could scarcely produce a harvestable yield. Finally it is certain that such a system is the best natural means for the maintenance or improvement of soil fertility, and the most practicable means for the control of soil erosion.

In a word, the all-year pasture system is highly productive and from every viewpoint economical.