

UNIVERSITY OF MISSOURI
COLLEGE OF AGRICULTURE

Agricultural Experiment Station

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CO-OPERATIVE EXPERIMENTS OF THE DEPARTMENT OF AGRONOMY.

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The Department of Agronomy of the Agricultural Experiment Station has been conducting co-operative experiments with farmers in various parts of Missouri for a number of years. The idea has been to extend the work of variety testing, of soil investigation, and of cultural methods to all the main soil types of the State, thus greatly increasing the effectiveness of the work of the Experiment Station and aiding in the distribution of improved varieties among the farmers.

These co-operative experiments include variety testing of corn, wheat, spring and winter oats, spring and winter barley, experiments with alfalfa, crimson clover, fertilizer experiments with potatoes, and grass experiments for the Ozark Uplands. In order that all who are interested in this work may become acquainted with these experiments, this circular has been prepared, giving the detailed plan of each.

On the last leaf of this circular will be found a blank on which one may indicate those experiments he desires to conduct. Tear off this leaf, marking with an X the ones you wish to conduct and mail to the Department of Agronomy, University of Missouri, Columbia, Missouri, for further instructions.

ALFALFA EXPERIMENT.

The object of this experiment is to determine the best means of securing a profitable stand of alfalfa on the various upland soils of

the state. Most well drained bottom lands will grow alfalfa successfully without soil treatment other than a very careful preparation of the seed bed.

The standard size for an experimental plot of this sort is one and a half acres, although in some cases it may be increased to two acres. This experiment will be put out only after a visit by one of the members of the Department for the purpose of selecting the soil and going over the matter carefully with the cooperator.

Plan of Experiment.

The land selected must be an uniform piece of upland soil, well drained and not particularly foul with grass and weeds. The piece is to be divided into six plots of equal size. The accompanying plan of experiment indicates the treatment given each plot.

INOCULATED.

NOT INOCULATED

: : PLOT 1 : : MANURE 12 TONS PER ACRE. : BONE MEAL 300 POUNDS PER ACRE. : LIME 6000 POUNDS PER ACRE. :
: : PLOT 2 : : MANURE 12 TONS PER ACRE. : BONE MEAL 300 POUNDS PER ACRE. :
: : PLOT 3 : : MANURE 12 TONS PER ACRE. :
: : PLOT 4 : : CHECK. :
: : PLOT 5 : : BONE MEAL 300 POUNDS PER ACRE. :
: : PLOT 6 : : LIME 6000 POUNDS PER ACRE. :

CULTIVATED.

The Station furnishes the seed, lime, bone meal, and inoculated soil; the cooperator furnishes the manure and carries out the experiment in accordance with directions. The cooperator is required to report the results of each cutting on blanks which will be furnished for this purpose, giving the comparative effects of the various treatments. He is required to make these comparisons by weight of hay for each cutting.

Method of Handling.

Alfalfa should be sown in late summer or early fall, but to secure proper results the preparation of the land should begin not later than the first of July. Both manure and bone meal should be applied before the land is plowed at the rates indicated and the plowing done by the first week in July if possible. If for any reason the bone meal should not be on hand by this time the plowing should proceed and the bone meal may be applied after the plowing is done. The manure is best scattered with a manure spreader, if one is available; and the bone meal from a bucket by hand unless a fertilizer drill is available; in this latter case it would be better to wait until the ground is prepared and drill in the bone meal. It is recommended in general to plow under the bone meal simply because most farmers haven't drills with fertilizer attachments. The plowing should be deep and thorough.

The lime is applied to plots 1 and 6 after the land is plowed. It is well to harrow once after plowing so as to level the land somewhat, then apply the lime evenly and, allow the after preparation of the seed bed to work it in thoroughly. Any sort of lime will be used for this purpose that is most convenient to secure, that is, air slacked, water slacked, or ground limestone. In case water slacked lime is used, the ordinary commercial lime is slacked to a fine powder with a minimum amount of water before scattering. This lime is best scattered evenly with a shovel, or in case of the ground limestone, it may be scattered by hand.

The land should be harrowed every couple of weeks, or after every rain, until time to sow. This is done to conserve moisture and to kill the weeds and grasses as they start. This harrowing is best done longwise of the plots to prevent tracking the lime or fertilizer from one plot to another.

The inoculated soil may be applied any time after the ground is broken. It will be most convenient to scatter it from a bucket, choosing a cloudy day, or putting it on late some evening to avoid bright sunlight, and harrow in immediately. The exposure of this

inoculated soil to bright sunlight for any considerable length of time is very injurious to the bacteria, hence these precautions regarding harrowing in, etc. It is not best to make the inoculated strip occupy the higher side of the area as in this case the inoculation may be washed down onto the uninoculated soil and interfere with the test.

Sowing.

Seed will be furnished at the rate of 20 pounds per acre and it should be sown at the rate of 15 to 20 pounds. If broadcasted it should be divided into two parts and one-half sown while walking north and south, the other half while walking east and west. This gives a more even distribution of the seed than if it is all sown at once. It will, of course, be necessary to set the seeder at one-half the regular rate. A light harrow should follow, covering the seed from one-fourth to one-half inch deep.

Another method of seeding is to place the seed in the grass seed attachment of a grain drill and sow, allowing the hoes or discs of the drill to cover it lightly. Some drills have attachments for sowing alfalfa seed from the grass seed box through the hoes. This is a very good way to sow if the hoes or discs run shallow. Still another method is to mix the seed with dirt or sawdust to give it bulk and sow from the grain box of the drill.

The best time to sow depends altogether upon the season, but on uplands it is usually about the middle of August in Central Missouri. It seems better usually to sow alfalfa before, rather than after, the middle of the month. If the seed can be sown just before a good rain, this is best, although a heavy beating rain is very apt to wash the seed out badly. Good judgment must be used in considering the best time to sow, but everything considered, it is usually about as well to sow between the 10th and 15th and allow the first rain to bring the seed up. Later sowing is frequently allowable, especially in the southern half of the State, but September 15th is usually the latest date in any season.

Cultivation.

The cultivation of alfalfa is given in this State mainly for the purpose of controlling the grasses, especially crabgrass, foxtail and bluegrass. It is best done in most instances with a dull spring tooth harrow or disc harrow set at a moderate angle and followed by a drag harrow. It should be done in this climate after the second and third cuttings. The ground is frequently too wet after the first cutting. There is little danger of injuring the alfalfa after it is well set, even

when the cultivation is very severe. In this experiment the cultivation should be done by double disking, or going over twice with a spring tooth harrow in either case following with a drag harrow to level the ground. These cultivations should be given after the second and third cuttings on the third of the plot marked "cultivated" leaving the rest uncultivated for comparison.

These cultivations must not be omitted in any case unless continued wet weather should interfere so long as to allow the alfalfa to start up and reach a height of 3 or 4 inches before being able to get on to the land.

This alfalfa experiment is to be continued until the success or failure of the various treatments is thoroughly demonstrated. This will require at least two seasons. Since alfalfa that looks very poor at the end of the first season may often come out well the next spring, the plot should be allowed to stand until the second spring even if it should look to be a failure at the close of the first season.

CORN VARIETY TEST.

The object of the corn variety test is to determine what variety or varieties of corn are best adapted to the various sections of the State and to aid in distributing these varieties among the farmers. The experiment consists of testing the following six standard varieties: Boone County White, St. Charles White, Commercial White; Reid's Yellow Dent, St. Charles Yellow, and Leaming. These are the varieties which have shown widest adaptations for Missouri conditions. Sufficient quantities of pure seed for planting $\frac{1}{4}$ acre each are furnished by the Station.

It is required that they be planted side by side on uniform land which is typical of the corn land of the region and which is of average fertility and not manured. They should not be planted on an exceptionally rich piece of ground, nor should they be given exceptional care. All conditions should be made as near like those under which the main crop is usually grown as possible, although the experiment must be given careful attention. If the ground selected slopes to any extent the rows should run up and down the slope rather than across it since the fertility of the soil at the lower side will usually be found to vary from that farther up sufficiently to offset or confuse variety characteristics.

The corn may be planted either by hand or with a planter, preferably in long rows rather than in blocks. Four or five kernels should be planted per hill of each variety, and when the plants are well started all should be thinned to the same stand. It is important

to have exactly the same area planted to each variety, and the stand exactly the same, so that all conditions may be similar. In most cases two stalks per hill will be sufficient, although on especially fertile ground three may be left.

The experiment may be located in a field by itself or in the main field if more convenient. In either case, four or five rows of other corn should be planted on the sides so that one variety may not be directly next the fence and hence liable to be injured by trees or to be trampled when plowing. The corn should be check rowed rather than drilled, as a more uniform stand can be secured in this way.

Notes are to be kept of the date of planting, character of growth, and time of maturity of each variety; and when mature each is to be harvested separately and the corn weighed. Blanks covering all of these various points are furnished each co-operator to be filled out and returned to the Experiment Station.

At the close of the experiment the Station furnishes free to each co-operator a peck of pure seed of his choice of these varieties for his own use as a compensation for his trouble and for the purpose of distributing the best varieties of corn throughout the State.

VARIETY TESTS OF SMALL GRAINS.

General Directions.

The variety tests of small grains include wheat, spring and winter oats, and spring and winter barley. The idea is to determine what varieties of these various crops are best adapted to the different sections of the State.

In each of the experiments the Station furnishes sufficient seed of each variety for planting one-half acre. These varieties must be drilled in rather than sown broadcast, in plots side by side. The rate of seeding and the size of the plot must be the same for each variety. The drill should be regulated by previous trial to sow the right amount before beginning on these experiments. Do not attempt to regulate it while drilling these varieties, and do not change the rate of seeding after starting. Drill in long plots rather than short, broad ones. It will be found convenient to arrange the plots by a certain number of drill rows across the field. This number should be the same for each variety even though some seed may be left over. The plots can then be readily measured; they are all the same size and the area of each can be easily determined.

A strip three or four feet wide should be left between the plots for convenience in harvesting.

The soil on which these tests are to be made should be uniform in fertility and must be representative of the average cultivated land of the region. If the topography of the land is rolling the plots should be arranged to run lengthwise of the slope rather than across it. The soil at the foot of a hill is usually more fertile than that near the top on account of washings, and hence the plots should be so arranged that one variety will not be placed on especially rich soil and another on soil less fertile. It is important to have all conditions alike for each variety so that the variations in yield will be due only to variety characteristics.

In each of these experiments notes must be kept as to the character of growth, rust resistance, lodging, and time of maturity of each variety. Each is to be harvested separately, threshed, and the weight of the grain obtained. In each case the seed remains the property of the co-operator. Since the varieties of none of these crops will mix when planted together, the seed can be kept pure if care is taken to avoid mixing while threshing. The machine should be allowed to run empty for several minutes after each variety is threshed in order to clean it out before another is run through. Then if seed is saved from the latter part of each run the liability of mixing is minimized. With proper care the co-operator can thus secure pure seed of those varieties which have proven best adapted to his land.

Spring Oat Variety Test.

The spring oat variety test includes the following varieties: Texas Red Rust Proof, Kherson, an early northern grown variety such as the Sixty Day or Early Champion, and a white or black local variety. Seed of the first three is furnished by the Station in quantities sufficient for sowing one-half acre each. The co-operator is expected to supply the local variety. Drill at the rate of two and one-half bushels per acre.

Wheat Variety Test.

The wheat variety test includes the following standard varieties: Smooth—Fultz, Early Ripe, Poole; Bearded—Fulcaster, Mediterranean, Turkey Red. These varieties represent a wide range of character and are among the most promising under test at Columbia. Seed sufficient for sowing one-half acre of each is fur-

nished by the Station. The ground should be plowed early and worked down to a well-prepared, firm, and compact seed bed. Drill at the rate of one and one-fourth bushels per acre.

Winter Oat Variety Test.

The test of winter oats is for the present limited to the region south of the Missouri River, although the Experiment Station has been able to bring a number of varieties through the winter at Columbia, some with good yields. Certain varieties of winter oats are generally hardy throughout the south third of Missouri when they are properly seeded.

This test includes two varieties which will be furnished by the Station and which appear hardy in the region south of the latitude of Jefferson City. The quantity of seed furnished will be sufficient for sowing one-half acre of each. They must be drilled in about the first of September at the rate of one and one-half bushels per acre on ground prepared as for wheat. They cannot be broadcasted nor sown later than the 10th of September. It is necessary to have the ground in good condition, and to sow early if they are to come through the winter satisfactorily. The idea in this experiment is to determine the adaptability of winter oats to south Missouri conditions rather than the determination of the adaptability of different varieties.

Variety Test of Spring Barley.

Barley is destined to become a more important crop in Missouri. It is therefore necessary that we know more about its adaptations for the various parts of the State. This test is put out for determining the adaptations of barley for Missouri conditions, rather than the adaptability of particular varieties. The test includes three varieties which will be furnished by the Station in quantities sufficient for sowing one-half acre of each. They should be drilled early in the spring at the rate of one and one-half bushels per acre, on land prepared as for oats.

Variety Test of Winter Barley.

Winter barley is being grown successfully by a few in Missouri, especially south of the river. It is valuable both as a grain crop and for winter and early spring pasture. This test is put out for determining its adaptation to the various regions. The test in-

cludes two varieties which will be furnished by the Station in quantities sufficient for sowing one-half acre of each. They should be sown in the fall at the rate of one and one-half bushels per acre on land prepared as for wheat.

MISCELLANEOUS EXPERIMENTS.

Pasture Grass Experiment For the Ozark Upland.

The Station is putting out a limited number of grass experiments in the Ozarks for the purpose of finding the best grasses for pasture purposes and the best means of seeding these grasses on the dry stony uplands of this region. The experiment consists in sowing a number of grass and clover mixtures in one-fourth acre plots on both old farmed and newly cleared land where possible, and allowing them to stand two or more seasons with proper regulations as to pasturing. These experiments will only be put out after a visit by one of the members of the department for the purpose of selecting suitable land and arranging the details with the co-operator. The Station furnishes the seed. The following grass and clover mixtures are used:

1. Kentucky Bluegrass and White Clover.
2. Canada Bluegrass and White Clover.
3. Kentucky Bluegrass, Timothy, Red and White Clover.
4. Orchard Grass, Red and White Clover.
5. Orchard Grass, Kentucky Bluegrass.
6. Orchard Grass, Kentucky Bluegrass, Perennial Rye Grass, Red and White Clover.
7. Orchard Grass, Kentucky Bluegrass, Timothy, Perennial Rye Grass, Red and White Clover.

Modifications of these mixtures will be made where necessary.

The soil selected for this experiment should be one of those in the Ozark region on which the pasture problem is a serious one. After staking it the plots of land will be plowed in the case of old land or left unplowed in the case of new or very rocky land. In both cases the seeds will be broadcasted and harrowed in. In the case of the new land the trees and brush must first have been gotten rid of, and a heavy home-made harrow should be used in scattering in the seeds among the stumps. The seeding should be done as early in March or April as the land can be gotten into condition, and on the old land a mower should be used once or twice during the season to clip any weeds that may come up. In either case sprouts must be kept down, and cattle kept off the land for at least the first sea-

son. In the case of the old land oats will, in some instances, be used for a nurse crop, sown quite thin and cut for hay when they are in the milk.

Experiments With Crimson Clover.

There is a great need in Missouri for a legume that will act as a winter cover crop and make an early spring growth. Crimson clover is one of the most suitable legumes for this purpose where the soil and climate are suitable. There are many dry stony and sandy lands in South Missouri where this clover should do well and the Station is offering a limited number of experiments with this crop.

Sufficient seed will be furnished for sowing one-half acre. It should be sown during the first half of August on a seed bed prepared for the purpose or between the rows of a cultivated crop, as corn. The seed should be broadcasted and lightly harrowed in.

Sufficient inoculated soil will be furnished for inoculating half the area sown. This should be broadcasted just before harrowing in the seed. The uninoculated half should be harrowed in first and the inoculated half last so as to prevent dragging inoculated soil onto the uninoculated part. It is highly important to know whether or not inoculation is necessary or unnecessary to success.

The clover should not be pastured in this experiment until the plants have made a large spring growth. Full notes should be made as to the stand and character of growth as well as to its general adaptability for the given soil and conditions.

Experiment With Vetch.

Considerable interest is being taken in vetch as a forage and green manure crop in Missouri, as indicated by the number of inquiries coming to the Experiment Station. This is a crop which has possibilities, although its adaptations to Missouri conditions have not been entirely proven. The greatest difficulty at present is the cost of the seed and the difficulty in securing a stand. Indications are, however, that so far as the stand is concerned this can be handled satisfactorily if proper conditions are brought about.

The vetch used in this experiment is the Winter Vetch and should be sown in the latter half of August on land prepared as for wheat. Only in the southern third of Missouri is it possible to sow later than this, and then not after the middle of September. Seed sufficient for sowing one-fourth acre will be furnished by the Station.

Fertilizer Experiment With Potatoes.

The use of commercial fertilizers on potatoes is of great value in giving a large crop of potatoes in most parts of Missouri. This fact is not realized by most growers and as a result, fertilizers are used for this purpose only to a limited extent. It is for the purpose of determining what can be done by the use of fertilizers on this crop as compared with barnyard manure and with no fertilization that this experiment has been planned.

The land selected should be uniform in fertility. Three strips of blocks, each one-fourth acre in area, should be staked out. One of these plots should then be manured with barnyard manure at the rate of 12 tons per acre, after which all three should be plowed deep and well prepared. After furrowing out, 100 pounds of the commercial fertilizer for potatoes should be applied to one of the unmanured plots, scattering the fertilizer in the furrow by hand. Potatoes should then be planted on all three plots alike and covered with the single shovel plow.

One-hundred pounds of a potato fertilizer will be furnished for this experiment containing about 2 per cent nitrogen, 10 per cent phosphoric acid and 8 per cent potash. It should all be used on the $\frac{1}{4}$ acre planned to receive it, going over the rows a second time if any should be left after the first application. Each plot is to be dug separately and the product accurately measured, the report being made on blanks furnished for the purpose.

Tear off this sheet marking with an X those experiments which you wish to conduct, and mail to Department of Agronomy, University of Missouri.

DEPARTMENT OF AGRONOMY

UNIVERSITY OF MISSOURI
Columbia, Missouri.

Gentlemen: I wish to conduct in co-operation with the Missouri Agricultural Experiment Station the following experiments:

Corn Variety Test.

Wheat Variety Test.

Winter Oat Variety Test (Limited to that part of the State south of the Missouri river.)

Spring Oat Variety Test.

Spring Barley Variety Test.

Winter Barley Variety Test.

Alfalfa Experiments.

Grass Experiments (For Ozark Uplands.)

Experiments with Crimson Clover (Designed for South Missouri.)

Experiments with Winter Vetch (Designed for South Missouri.)

Fertilizer Experiments with Potatoes.

I agree to follow the directions of the Station in conducting these experiments and report accurately the results whether favorable or unfavorable.

Name

P. O. Address.....

Express Address

(If different from P. O. Address.)