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AGRICULTURAL COLLEGE.

Bulletin No. 35

OR

Station Bulletin No. 2.

GRASSES FOR PASTURES AND FOR MEADOWS.

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BULLETIN No. 35

OF THE

MISSOURI AGRICULTURAL COLLEGE,

OR

NO. 2 STATE AGRICULTURAL EXPERIMENT STATION.

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W. POPE YEAMAN, LL. D.

*President Board of Curators University of Missouri and
Agricultural College:*

Sir :

Scientific investigation and the world's common experience have shown beyond a doubt that tillage crops are wasteful of soil fertility, while the grasses are nature's great soil conservators and should have and do have, in all high agriculture, a prominent place in crop rotation. In western agriculture they are used to a minimum extent, with the result shown by statistics that our crops have declined with a rapidity phenomenal in the world's agriculture. Machinery gave us the opportunity for the wide tillage we pursue. In 1880 we had but 8.3 per cent. of our total field crops in meadow grasses. These grasses have slowly increased until we had in 1885, 12.4 per cent. of our total field crops in grasses. These figures are almost exactly reversed in New England, while Europe has much more of her area in the grass crop.

While we are deficient in the ratio of grasses sown, compared with those places where high agriculture exists, we are also equally wanting in the variety in use. Little is known of grasses that are adapted to our soil and climate.

PASTURE GRASSES.

In the fall of 1883, in pursuance of a policy of reorganization of the farm system into a fixed rotation, 50 acres of ground that had been for many years cropped with corn after corn until badly worn was sown to a mixed variety of pasture grasses for permanent pasture. The varieties were as follows :

Kentucky blue grass.....	3½ lbs.
Orchard grass.....	3½ "
Timothy	3 "
Red top.....	3½ "
English rye grass (<i>lolium perenne</i>).....	3 "
Red clover.....	2½ "
Alsike clover.....	1½ "
White clover.....	1½ "

This mixture sown without knowledge of the demands of our soil and climate and limited at the time in number to the more available and cheaper sorts from want of funds, has proven in a relative sense very successful. This county of Boone has very fine blue grass pastures, yet this section of mixed grasses, which is a part of a large pasture, a part of which has excellent blue grass, has proven superior to the blue grass and more to the taste of the stock. They remained for weeks on this fifty acre section while having free access to the rest of the pasture, and although the season was an unusually severe, or dry one, fifty-two head of cattle grazed upon it until the fall months without making use of the balance of the pasture save at long periods, passing weeks at a time, and then only for a mere cursory run over it.

VARIETIES IN PLATS.

Some forty varieties in all were sown during the season of 1886. They were sown August 30, upon ground that had been fallowed during the summer to exterminate weeds. The ground was clay loam of not very good quality nor in good state of fertility. The fall of 1886 was dry and the season of 1887 a very dry one. Thus our grasses were put to a severe test, and those thriving may be expected to continue to.

I will name those first that I would advise for a pasture mixture, so far as two or three seasons' observation will qualify me to judge from 1-20 acre plats in growth and feeding.

A good pasture should contain grasses that are adapted to wet and to dry seasons; that flower early and late or as continuously over the season as possible; that root in varying areas of the soil; that afford a good mixed diet; that will spring up well after grazing, and that fill the soil, giving a close, dense mat of grass.

While we are wont to look upon bluegrass as affording a typical pasture, it will be found quite inferior to a well-formed pasture of mixed grasses. Bluegrass yields a small crop of hay, and, therefore, must not be expected to keep the maximum amount of stock per acre. Nor can a single grass grow cattle as fast, nor fat them as well as a mixed turf, affording its better nutritive ratio and, by its variety, more palatable food.

In reviewing the varieties tried here, I shall not give historical notes on the grasses nor a botanical description of them, as such data are now pretty well scattered, but shall confine myself to stating in the main what they are doing for us. I will name first those that I would advise for a mixed pasture for our conditions in Missouri.

I. KENTUCKY BLUE-GRASS is too well known in Missouri to discuss in detail. Its great merit as a fall and winter grass, its close sward, its endurance of tramping and continuous grazing, and its palatableness make it indispensable for limestone soils. It is sadly deficient during drought and not first in yield. Seed germinated well; April 1, growth moderate;

April 26, ditto; June 14, ripe, even stand; cut June 22; weighed 3,800 pounds; stood thirty inches; weight, March 3, 2540 pounds; well eaten by stock; headed May 14; ripe June 5. The second year's crop was 1,500 pounds weight. I should have before stated that the severe drouth of 1887, the bad winter of 1887-8, and dry spring of 1888 have resulted in a thin stand of grass, with a very slow spring growth. The crop of this year will be the poorest Missouri has received for years.

II. MEADOW FOXTAIL (*Alopecurus pratensis*). The reader must discriminate between this and the poor grass growing so freely in our pastures and known as foxtail. This grass has been a continuous and happy surprise to me, which, if permanent, and I see no reason why it should not be, introduces to our state a grass that will have very great value to us. It resembles timothy, but has a smaller and softer head, is much more leafy, springs up wonderfully quick when mown or fed off. By reputation where most used in England and in the east, it is a lover of a wet or rather moist soil and season, and yields a bulky, but light-weighting hay. With us it germinated well, stood a dry fall, wintered well, was among the first beginning to head April 1; April 26, well headed and some blooming and first-ripe in May. While not cut until June 2, its leaves were a dense mass of green, although the heads were long since ripe and drought set in. In this regard, I have not seen its equal for maintaining its freshness, while its leaf development was great. Yield, when cut, 4,500 pounds; March 3, weight, 3,600 pounds; eaten fairly well. 1888: April 1, began to head; May 1, in bloom, and decidedly the first of

all of our grasses ; ripe May 25 ; weight, 2,975 pounds ; height two to two and one-half feet ; eaten quite well.

Every one that has seen the grass has received a very high opinion of it. To me it seems to have exceeded its known record when soil and season are considered, and promises to be a first-class pasture grass, giving the first fresh bite in the spring.

III. ORCHARD GRASS. This grass in new pasture mixture was green with its broad leaves when drought had turned Kentucky blue grass as dry as it well could be. On the plats it did not come through the winter as well as the above grass, and during the entire month was decidedly behind it and ripened a fortnight later, or about June 1, 1887. Height forty-two inches ; weight, April, 1887, fourteen hundred pounds ; fairly eaten ; 1888 started better than in 1887, and third on the list ; yielded 1888, eleven hundred and twenty pounds. The plat was washed by rain and furrowed and the trial not a fair one, yet it has disappointed us as a hay grass.

IV. MEADOW FESCUE (*Festuca pratensis*). I am inclined to place this grass fourth on the list for our soil on account of its adaptation to soil and climate, and yield. See hay grasses.

V. RHODE ISLAND BENT GRASS (*Agrostis Canina*). This grass belongs to the same family as red top does, which it much resembles. It grows finer, gives a closer turf with me, and bears *all* of the appearances of being a better pasture grass. April 1st, it was in fine order, when cut was more erect than red top, stood twenty-seven inches high, yield 6200 pounds, weight in March, 4950 pounds. It was not so well dried

at the time of cutting as the earlier grasses, as it is later maturing than those previously mentioned, being in bloom June 23, but later it fairly compared with red top. Its leaf development, its soft fine stem, and good mat of grass impressed me favorably with it for pasture. Winter of 1887 and 1888 it came out in good order and made a good but later start than the above grasses. Weight for 1887, 2960 pounds. Bloomed June 20.

VI. TALL OAT GRASS (*Avena elatior*). This grass made an early and grand start, pushing up the rankest of the early growing grasses. It ripened about June 1, stood fifty-four inches tall, and weighed 5360 pounds in a very dry condition as it was over-ripe when cut; weight March 3, 4,300 pounds. It is a little coarse for hay, and in this case being late cut was not so well relished as some of the other grass. Its early growth, broad green leaves, luxuriant development, sustained the reputation it has for pastures when in a mixture. I was particularly struck with the large amount of food furnished at an early date, which seemed to fit it for furnishing an early bite. In the season of 1888 it again started early and rank, headed May 14, and was ripe at cutting, June 11, weight 3730 pounds.

VII. ENGLISH RYE GRASS, (*Lolium perenne*.) This is in my pasture mixture, where it has done very creditably and I would add it to a pasture mixture. See hay grasses.

VIII. To complete the pasture mixture I would add white, red, and Alsike clovers, making ten in all. This is my judgment for the average soil of our state as viewed from the workings of the sorts tried. Such

a pasture when well formed and kept free of weeds, bushes, and shade trees, beyond a few for stock shade, will give to cattle a remarkable growth and will fatten them in very good order.

I have other sorts valued only for pasture, and others that have done fairly as field grasses that may be added to extend this list.

I. SHEEP FESCUE (*Festuca ovina*.) This grass made a slow, feeble start, growing in bunches and affording a growth that would put it out of the question for hay. Its reputation points it out as fitted for dry, poor soils and dry seasons. It is found in good sheep pastures, and is used in English and some American mixtures for pastures. I would not use it where soil and climate were adapted to the previous varieties, although it has not had a fair trial by me, being on a dry and thin soil which extended two plats into my varieties. Ripe, June 14; height, twelve to twenty-four inches. It grew in bunches with slender stems and very narrow, light colored leaves.

II. HARD FESCUE (*Festuca duriscula*). History much like the above only darker in color with a dense mass of narrow leaves at base of stem, growing in stools and seems to promise better for pasture with us than sheep fescue, sixteen to twenty-seven inches.

III. RED FESCUE (*Festuca rubra*). Wintered well, grew twenty-seven to thirty inches tall, having a denser mass of more inviting looking fine leaves than numbers one and two, and seems worthy of trial in a pasture mixture. Owing to the imperfection of the seed used the stand and yield of neither of the above three sets were sufficient to give them a feeding test.

IV. CREEPING BENT GRASS (*Agrostis stolonifera*). Its prostrate habit fits it only for pasture, but showed no good reason why it should supersede either red top or Rhode Island bent grass to which it is related very closely. It grew a dense mat of grass, proved hardy, promised well for pasture, measured 20 to 24 inches, weighed 3,600 pounds when cut June 23, and 2,800 pounds in March.

The second year it started feebler than Rhode Island bent grass or red top. Weight 2,240 pounds. Bloomed about with the above grasses, cut June 27.

V. ROUGH STALKED MEADOW GRASS (*Poa trivialis*). Resembles closely Kentucky blue grass, but is fond of shady moist places and does not thrive so well, it is said, in open sunshine. Germinated well, grew moderately, stood 29 inches high and weighed 1,800 pounds in June and 1,600 pounds in March. Do not think it will be desirable for open pastures where other grasses thrive in this state, although in a mixture it would come in place in cloudy wet years. It should be understood that a grass is often very desirable in a mixture that would not at all be considered for use alone.

Second year started well, headed May 14 and was ripe first week of June. Weight 1,840 pounds, surpassing Kentucky blue grass and making a good yield for this year. The season of 1888 is two weeks later than 1887.

VI. ROUGH STALKED MEADOW GRASS (*Poa nemoralis*). Germinated well; grew moderately; flowered June 15, stood 2 feet of very even stand; weighed 2,200 pounds and March 3, 2,000 pounds. Promises very fairly for pastures and will doubtless grow well

in our climate in moist years or on moist shady places. It should not be forgotten in behalf of all of the moist soil and season grasses or those adapted to shady places that 1887 was a dry hot year. Season of 1888, it gave a fair start, headed well May 14, and was cut May 27, when it was over-ripe, weighing 3,300 pounds in a very dry state. The previous grass was cut June 11.

VII. SWEET VERNAL GRASS (*Anthoxanthum odoratum*). In view of the well known record of this grass for a little short growth, it fairly surprised me, for it seems to have outdone itself with us. Its stand was most admirable, in fact it formed the densest mat of grass ever seen by me for a first year's growth. When stretched to its height, it stood up well, measuring 22 inches. Ripened about the twentieth of June, and was so completely flat that it could not be mowed. But a fine mass of grass for pastures lay on the ground. Its well known agreeable odor was very pronounced. I would use it in pasture mixture.

Season of 1888 it started from the seed of the previous year, for it seems that its dense mat had by some means smothered the life out of itself. Its second year's growth was feeble and short. This may be due to the condition of the ground, for during the drought of 1887 when all other ground was baked hard one sank through a soft crust on this plat.

MEADOW GRASSES.

I. TIMOTHY.—This grass is well and favorably known to our State, in fact is the only true hay-grass grown to any extent in Missouri. Stand perfect.

Bloomed middle of June. Stood 44 inches high. Weighed 5,200 pounds, and on March 3d, 4,360 pounds. It was somewhat injured by a worm at and just before blooming which may have reduced its yield, especially as it lodged.

The second year its start was very vigorous and was out of bloom June 27. Weight of crop 4,600 pounds.

II. MEADOW FESCUE (*Festuca Pratensis*).—This grass for 1887 gave me the best satisfaction of any grown for hay and I regarded it then as exceedingly promising for Missouri. It germinated well, wintered well, started well in the spring, gave more leaf than timothy and less coarse stem, stood erect, 48 inches. Yielded 5,680 pounds and March 3d 4,450 pounds. Bloomed a few days earlier than timothy.

For 1888 it was less vigorous but started well and did very well, giving 3000 pounds yield of ripe hay June 27. I regard it as very promising for us.

TALL FESCUE (*Festuca Elatior*).—This grass is being advised by several good authorities but it proved inferior to meadow fescue here in germination, yield, vigor and quality. It ripened early in June, stood 42 inches, yielded 2,200 pounds, March 3d weighed 1,500 pounds. This light yield was due much to inferior germination. The seeds, rarely used, are held over by seedsmen and their germination is lowered. The grass is worthy of trial.

Season of 1888 it started very fairly and yielded 2,240 pounds. It seems from these figures compared with meadow fescue that this grass had gained somewhat over the previous year and warrants the attention of our farmers.

IV. RED TOP.—I need only say that it throve on our soil as every one knows how it will thrive on Missouri soil. Among the last to ripen, blooming June 14, stood 44 inches when straightened up and harvested 7,000 pounds of imperfectly cured hay, yet gave in March 5,560 pounds dry hay. Its love of moist land and seasons all know.

V. ORCHARD GRASS (see Pasture Grasses).—Its promise is as yet not so good as timothy or meadow fescue. It is, however, becoming popular in the state.

VI. TALL OAT GRASS (see Pasture Grasses).—It will yield well in our state, but its coarseness and probable lack of palatableness will make it questionable for hay. Many praise it.

VII. YELLOW OAT GRASS (*Avena Flavescens*). Seed very light and germination very poor, growth very slow. Height—stood 36 inches, is leafy, ripened in early June. Yield—weight in March 1,600 pounds, but not fair test as not, one-third of stand. Second year started vigorously and gave 2,925 pounds. I doubt its value as a hay grass but many praise it. It will thrive with us and should therefore receive further trial.

VIII. ENGLISH RYE GRASS.—It gave the finest start immediately after sowing of any put in. In the spring it started early with vigorous promise. Later it grew slower, but gave a dense yield of promising grass. This hope was destroyed by lodging as flat as though rolled with a ponderous iron roller. Ripened in early June, measured 30 inches and gave two tons of dry hay in March, which of course was not so well relished as

other varieties above named which stood up well and were all eaten, as fine soil was filmed over it.

The second year or spring of 1888 its start was miserable, although it was in good quantity in number of plants. Its vitality was exhausted, acting very much like a very imperfect perennial.

This grass has stood well in the pastures with the protection of other sorts. As a hay grass it is to English agriculture much the same as timothy is to ours.

Yield second year 2,920 pounds of well dried hay. It weighed very heavy for bulk. Ripened about June 20.

IX. ITALIAN RYE GRASS (*Lolium Italicum*). This is the great irrigating grass of Italy. It is known as an annual in this country at the north. It winter killed a little the first year, and worse the second year, although the grass living was more vigorous than English rye grass. It grew ranker than this grass, ripened later, stood forty-four inches, was leafy, weighed at harvest for 1887 four thousand pounds and in March thirty-four hundred pounds. It may have a place in Missouri agriculture, but seems to have suffered too much from either drought or winter freezing, probably both.

It was so thin of growth for 1888 that it was not weighed.

THE CLOVERS.

I. **ALSIKE CLOVER.** This was sown in the fall with the grasses September 1. Stood the winter better than red clover. Started more vigorously, gave work for the bees, was ripe in early June. Stood twenty-four to twenty-seven inches and did not mind the drought. Yield forty-eight hundred and forty pounds, March 3 thirty-eight hundred pounds. This is another plant little known or unknown in the practice of our state, that seems to outdo itself or its record in relation to the other clovers. It stood a severe winter and drouth and did the best of any clover sown. Its germination was not perfect, therefore its yield, not representative. I regard it as very promising. It started a full stand for 1888, ripened the first of the clovers, or first week of June. Weighed fifty-three hundred and ninety pounds, but not quite cured, but as well as the following clovers.

II. **RED CLOVER.** Some winter killed. Heads brown June 14. Height twenty-six inches. Yield thirty-six hundred and eighty pounds, not well dried; March 3 weighed twenty-four hundred pounds. Did not winter as well second winter as Alsike, but thickened up from its seed and gave June 27, forty-nine hundred pounds clover.

III. **LARGE RED CLOVER.** It had much the same record as number two and carried no more size that I could discover. Weighed thirty-seven hundred and eighty pounds and in March twenty-four hundred pounds. The stand was thin. The season of 1888 it

out grew the common red clover and gave fifty-three hundred and eighty-three pounds yield.

IV. PERENNIAL RED CLOVER. This gave in every respect the poorest record of clovers. However, when clover is fall sown the record must be in a large measure accidental as the clovers will not stand the winter unless under a good growth the first year. I began in the spring to fit the ground for summer sowing after fallowing out the weeds. But the drought delayed the sowing until late. They were filled in in the spring. Again they met a bad season. This clover for 1888 was a complete failure.

V. ALFALFA.—This plant is being introduced into the state in many sections. Stood fall drought and winter freezes well. Ripened about 8th of June. Height 30 inches; yield 3,320 pounds at cutting. Started well for second crop but severity of drought reduced it to a moderate yield.

It has the reputation of improving after the first year's growth.

The crop of 1888 started more vigorously than in the previous year, notwithstanding grasses and clovers were looking worse than for years.

June 11, 1888, it harvested 3,700 pounds of dried fodder on a good stand. It has been on the farm several years and so far does not promise to equal red clover for our soil either in yield or palatableness.

VI. SANBOIN (*Onobrychis Sativa*).—This leguminous crop is a very rich cattle food and in high favor in France and other European sections. It had

headed out April 26 and was ripe in May. It remained green long after it was ripe, had a good leafage and carried promise of good pasturage as well as a fodder crop. Yield at harvest 2,400 pounds and 1,500 in winter. There was not one-half of a stand on account of poor seed and dry year.

It started well in spring of 1888 and flowered the 1st of May. It was covered with the bees. It strikes me favorably for this state.

Very respectfully submitted,
J. W. SANBORN, *Director.*